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285. NOTES ON THE OSOBUDANI CONGLOMERATE AND SOME LOWER PERMIAN FUSULINIDS CONTAINED IN ITS LIMESTONE PEBBLES PART 1.*

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尾添谷礫岩とその石灰岩礫中の下部二畳系紡錘虫その 1: 尾添谷礫岩は亀井節夫が一の谷礫岩と呼んだものに相当するが，層序および石灰岩礫中の化石から，この礫岩の時代について論じた。礫に含まれる化石のうちで，*Hayasakaina* 属について二・三記述した。　猪 郷 久 義

Introduction and Acknowledgements

It has already been pointed out by KAMEI (1952) and MINATO (1950) that the Paleozoic rocks in the Fukuji District in the Hida Massif intercalate two interesting conglomerate deposits, which have been named Murakami Conglomerate and Ichinotani Conglomerate.

Fig. 1. Locality of the Osobudani Conglomerate (×)

KAMEI considered the Ichinotani Conglomerate to form the basal part of his Ichinotani formation, which he interpreted as belonging to the Sakmarian to Artinskian in age. He further stated that the conglomerate is a correlative of the Sakamotozawa Conglomerate developed in the southern part of the Kitakami Massif in Iwate Prefecture, and maintained that the Carboniferous Sorayama formation was eroded away prior to the deposition of the Ichinotani formation.

The Osobudani Conglomerate is a name introduced to replace that of Ichinotani Conglomerate, because it conflicts with that of the formation, and therefore, is liable to cause confusion. From this conglomerate, I have collected a large variety of fossils indicating different geological ages, as will be stated later.

From the Ichinotani formation, I was fortunate in discovering a rich fauna of fusulinids, which indicate Chesterian to Wolfcampian age for the formation. Furthermore, the discovery of several late early Permian fossils in the limestone pebbles of the Osobudani Conglomerate clearly proves that the age of the conglomerate is younger than first considered by KAMEI.

* Read June 18, 1955 at Kyoto, received Aug. 22, 1955.

Before continuing, I wish to express my gratitude to Professors Haruyoshi FUJIMOTO, Kotora HATAI and Hidekata SHIBATA of the Institute of Geology and Mineralogy, Tokyo University of Education, Mr. Rokuro MORIKAWA of the Saitama University, Mr. Tadao KAMEI of the Shinshu University, and Mr. Shigema KAWADA of the Institute of Geology and Mineralogy, Tokyo University of Education, for their kind guidance and encouragement.

Notes on the Stratigraphy

As a result of field work and paleontological investigation, I have classified the Paleozoic rocks developed in the Fukuji District, into the following lithogenetic units.

Sorayama group		middle to lower Permian
	Osobudani Conglomerate	
——unconformity ?——		
Ichinotani group	Mizuyagadani formation	
	Ichinotani formation—highest lower to upper Carboniferous	
- - - fault - - -		
Fukuji group	Gotlandian	

Within the Ichinotani group I have been successful in discriminating six fusulinid zones, which in descending order, are as follows: (6) Zone of *Pseudoschwagerina*, (5) Zone of *Triticites*, (4) Zone of *Fusulina*, (3) Zone of *Fusulinella*, (2) Zone of *Profusulinella*, (1) Zone of *Millerella*.

Details on the stratigraphy and paleontology of the Paleozoic rocks in the said area will be presented at another opportunity.

With regard to the boundary between the Carboniferous and Permian, I have found that no conspicuous hiatus can be recognized between the top of the Ichinotani formation and the basal part of the Mizuyagadani formation. Field evidence suggests that the two formations were probably deposited without break, at least so far as has been observed in the field. However, it is worthy of note that the lithologic characters of the limestones of these two formations are quite contrasting, the upper part of the Mizuyagadani formation consisting largely of clastic sediments.

The Sorayama group, which is the youngest unit developed in the present area, consists of the Osobudani conglomerate at its lower, followed with sandstone, shale, limestone, and so-called schalstein. The exact age of the main part of this group has not yet been worked out.

The Osobudani Conglomerate

The Osobudani Conglomerate with its type locality at the middle course of the Osobudani Valley, measures ten meters in thickness and consists of unsorted, subangular to well rounded pebbles of various kinds of rocks, which are cemented with greenish gray, coarse grained sandstone. The pebbles comprise limestone, shale, chert, tuff, tuff breccia, and the so-called schalstein among the sedimentaries, and those of such igneous rocks as granite, porphyritic granite, porphyry, andesite, and

spilitic basalt.

The limestone pebbles contain fossils belonging to the Gotlandian, Carboniferous and Permian ages, namely: Gotlandian:—*Favosites* sp. (*gotlandicus* type), *Clathrodictyon* sp., *Atrypa* sp., Carboniferous:—Clithiophylloid coral, Permian:—*Schubertella* sp., *Hayasakaina kotakiensis* FUJIMOTO and KAWADA, *H.*? *kawadai* IGÔ, n. sp., *Pseudofusulina duplithecata* IGÔ, n. sp., *P.* sp. *A.*, *P.* sp. B, *Misellina minor* (DEPRAT), *Iranophyllum* sp., *Wentzelella fluxuosa* HUANG, *W.* sp.

Although it is evident that *Favosites* and other Gotlandian fossils were derived from the Gotlandian Fukuji group, it is important to note that *Pseudofusulina* and other Permian fossils are lacking within the upper division of the Mizuyagadani formation.

The Osobudani Conglomerate is also exposed along the upper course of the Mizuyagadani and Ichinotani Valleys, where its general lithological characters are quite similar to those of the type locality, except for that no limestone pebbles occur. The pebbles comprising the conglomerate at the two mentioned localities consist of very well rounded (5-30 cm in diameter) granite, andesitic rocks and green rocks of schalstein and its allies. The cementing material, like that of the type locality, consists of coarse grained sandstone. It is to be added that the stratigraphic relation between the Osobudani Conglomerate and underlying Mizuyagadani formation is not distinct at the above stated two localities.

Although no distinct unconformity has been recognized in the field, it is assumed on the basis of the existence of a large amount of granite and its allied plutonics and limestone pebbes containing Gotlandian to early Permian fossils, that there was considerable disturbance of the hinterland during deposition of the early middle Permian rocks in this district.

The existence and distribution of middle Permian conglomerate bearing deposits are not well known in the Japanese Islands, but of those known, the following are considered to be approximate correlatives, namely; the Kanokura conglomerate in the southern part of the Kitakami Massif, the Kosaki formation of Kyushu, and the Sawando conglomerate of Nagano Prefecture.

Notes on the Paleontology

The limestone pebbles, which may be assigned to the Permian from their fossil content, are found to yield such fossils as:- *Schubertella* sp., *Hayasakaina kotakiensis* FUJIMOTO and KAWADA, *H.*? *kawadai* IGÔ, n. sp., *Pseudofusulina duplithecata* IGÔ, n. sp., *P.* sp. A, *P.* sp. B, (*P. vulgaris* type), *Misellina minor* (DEPRAT), *Iranophyllum* sp., *Wentzelella fluxuosa* HUANG, *W.* sp.

Among the listed species, *Pseudofuslina duplithecata* is very interesting from the view that it is characterized by a double development of the spirotheca, namely, the keriotheca is divided into two parts, outer and inner.

Another interesting feature of the fossils contained in the limestone pebbles is the occurrence of *Misellina*. This genus has hitherto been considered to occupy a position high among the Permian, and therefore, its occurrence with lower Permian species suggests that its phylogeny is a problem for further investigation.

According to FUJIMOTO and KAWADA (1953), who established the genus *Hayasakaina*, the axis of coiling changes at maturity, and this features suggest that it may be an aberrant descendant of *Ozawainella* THOMPSON.

The occurrence of numerous specimens which are assignable to the genus *Hayasakaina* in broad sense has provided me with an opportunity to make observations on the character of the change of axis of coiling and other features, as will be described in the following lines.

If the axis of coiling of the outer volutions completely changes to inner, a tunnel must appear in the outer volutions. Such a phenomenon is not shown in any of the final two or three volutions in the illustrations given by FUJIMOTO and KAWADA. However, in my specimens I have observed tunnels in some. Concerning the change in axis of coiling, there is little doubt that the sagittal sections will not exhibit at maturity, an axially oriented aspect.

Hayasakaina ? kawadai differs from *H. kotakiensis* in its shape and size. Serial sections of the former species show that it does not change in axis of coiling and is probably planispiral throughout. It, however, is referred to the genus *Hayasakaina* with the reservation that the more than twenty specimens are not senile and the outer volutions are not destroyed.

Although the spirothecal structure of this genus is very obscure, some well preserved specimens from Fukuji, show that it consists of a dense tectum and underlying rather transcurrent layer. From such features, I suggest that *Hayasakaina* closely resembles both *Nankinella* LEE and *Staffella* OZAWA.

It was mentioned by FUJIMOTO and KAWADA that *Hayasakaina* resembles *Ozawainella* and may be a descendant therefrom. However, from the characters so far mentioned, it seems to me that *Hayasakaina* more closely resembles *Nankinella* or *Staffella* than *Ozawainella*, and it may have diverged from either of the two mentioned genera.

It is well known that secondary replacement of mineralization of fusulinids may be different from the original shell character, and thus be an important criteria for generic character. I have also made many observations on this problem, taking into account the differences in size of crystallization, their arrangement and positions within the shell, and hope to further investigate by other methods.

Description of the Interesting Species

Genus *Hayasakaina* FUJIMOTO and KAWADA

Hayasakaina kotakiensis FUJIMOTO and KAWADA, 1953

Pl. 27, Figs. 1, 6, 12-16.

1953. *Hayasakaina kotakiensis* FUJIMOTO and KAWADA, *Sci. Rep., Tokyo Bunrika Daigaku, Sec. C., Vol. 2, No. 13,* pp. 208-209, pl. 1, figs. 1-10.

Shell small, subspherical or subovate in outline with rounded median part and broadly convex axial part; short axis of coiling. Axial length 1.2–1.6 mm, median width 1.6–2.2 mm, form ratio 1 : 0.68–1 : 0.84. Mature specimens with eight or more volutions.

Inner six or seven volutions highly replaced with secondary mineralization, characters obscure. Height of first to eighth volution, ? , 0.035, 0.085, 0.087, 0.014, 0.021, 0.026, and 0.023, respectively. Inner young volutions coiled planispiral and discoidal, outer one or two senile volutions coiled at right angle to axis of inner ones.

Spirotheca thin, 20–50 μ in last volution, its structure indistinct, composed of thin tectum and underlying relatively thick layer.

Septa numerous, not fluted throughout shell, generally thicker than spirotheca

or almost equal to.

Tunnel of inner volution obscure, outer ones low, about one third or one fourth as high as chamber. Chomata obscure.

Remarks:—The Fukuji specimens of *Hayasakaina kotakiensis* are closely similar to the type specimens from the Omi limestone in shape and other character. However, the present specimens are of larger size and more highly replaced with secondary mineralization; such differences may not be of specific value.

Occurrence :—The limestone pebbles from the Osobudani Conglomerate, at the middle course of the Osobudani Valley, Fukuji, Kamitakara Village, Yoshiki District, Gifu Prefecture.

Associated fossils and geological age :—*Schubertella* sp., *Hayasakaina* ? *kawadai* Igô, n. sp., *Pseudofusulina duplithecata* Igô, n. sp., *P.* sp. A., *P.* sp. B, *Misellina minor* (Deprat). Late lower Permian.

Hayasakaina ? *kawadai* Igô, n. sp.

Pl. 27, Figs. 2-5, 7-11, 17-20.

Shell small in size, discoidal with sharply or acutely rounded pe.iphery and somewhat inflated poles. Immature stage perfectly planispiral.

Axial length 1.4–0.96 mm., average 1.0 mm., width 1.8–2.7 mm., average 2.3 mm., form ratio 1 : 0.37–1 : 0.55, average 1 : 0.44.

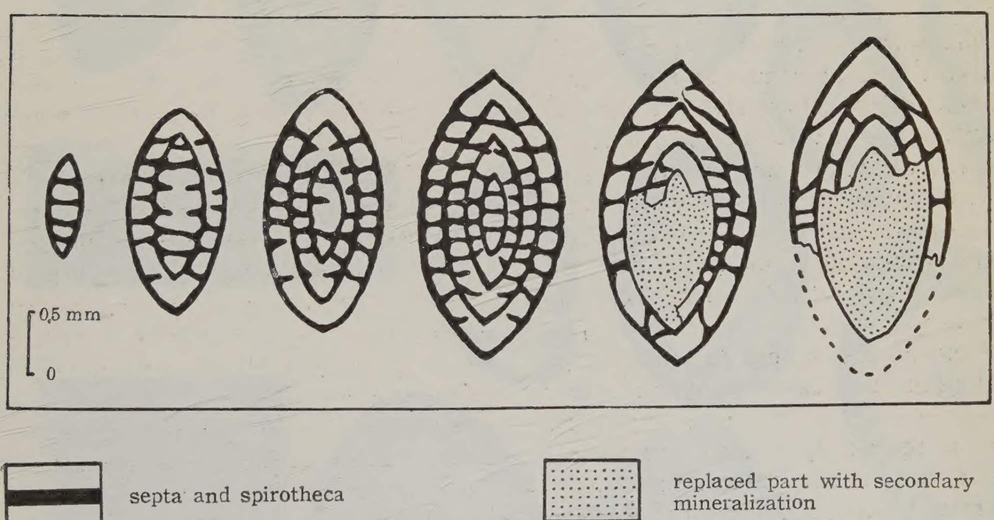

Fig. 2, Serial sections of *Hayasakaina* ? *kawadai* Igô, n. sp.
All figures are drawn by Morikawa's Sump figure.

A large specimen consists of eight to nine volutions. Inner volutions highly replaced with secondary mineralization. Each volution gradually increasing their height, being 0.026, 0.035, 0.052, 0.087, 0.10, 0.17, 0.24, and 0.23 respectively in well preserved specimens.

Spirotheca thin, composed of thin and dark layer, probably the tectum and underlying rather thick transcurrent layer, the diaphanotheca ?. Thickness of spirotheca in last volution 0.022–0.069 mm.

Septa relatively thick, septal count of outer volutions, 24 and 27. Tunnel of outer volutions high.

Remarks:—I have examined more than

twenty specimens and all of them are perfectly planispiral and show no change of the axis in the outer volutions, thus it may be doubtful whether they can be referred to the genus *Hayasakaina* in narrow sense. They are referred to the named genus, merely tentatively.

Occurrence and geological age:—The same as for the preceding species.

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Explanation of Plate 27

Hayasakaina kotakiensis FUJIMOTO & KAWADA

Figs. 1, 6, 12-16. Axial sections (slightly tangential) ×20. Reg. no. 20222, 20240, 20241, 20222, 20238, 20236, 20246.

Hayasakaina kawadai IGÔ, n. sp.

Figs. 2, 17. 18. Sagittal sections of three cotypes. ×20. Reg. no. 20246, 20241, 20238.

Figs. 3, 4, 7-11. Axial sections of cotypes (slightly tangential except figs. 4, 7.) × 20. Reg. no. 20243, 20242, 20242, 20237, 20242, 20236, 20239, 20245.

Figs. 5, Tangential section of cotype. ×20. Reg. no. 20241.

Figs. 19, 20. Enlarged part of axial sections showing spirothecal structure. ×100. 20240, 20240.

(All specimens are in the collections of Tokyo University of Education.)

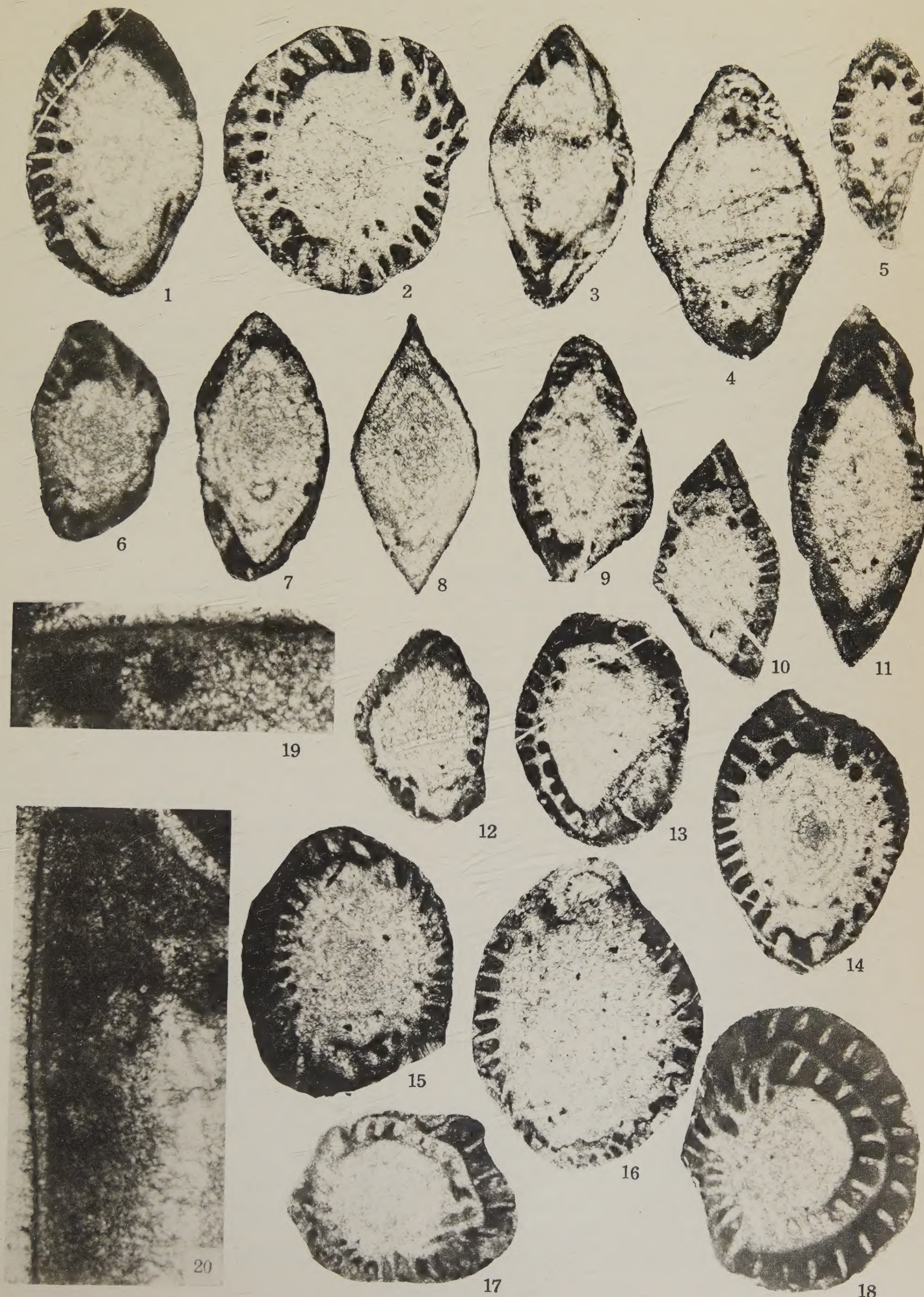

Photo. by S. Aoki

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286. ON THE MIOCENE PECTINIDAE FROM THE ENVIRONS OF SENDAI: PART 7; ON *PECTEN KANEHARAI* YOKOYAMA*

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仙台附近中新統産 Pectinidae, その 7, (*Pecten kaneharai* YOKOYAMA について):

Pecten kaneharai YOKOYAMA は日本の新第三系に多産し，非常に重要な種である。併し，模式標本が不完全であつたためと，現在その標本が失われているために多くの混乱があつた。筆者は東北大学理学部地質学古生物学教室，宇都宮大学学芸学部地学教室に保存されている同地模式標本，及びこれに同定出来る仙台附近より採集した標本を検討して記載した。

更に本種を多く含んでいる七北田層下部の堆積学的考察によつて，本種の古生態学的な意義を論じた。

増田孝一郎

Introduction and Acknowledgements

Among the Japanese Tertiary Pectinidae *Pecten kaneharai* YOKOYAMA can be considered to be one of the most important and interesting species, particularly from the view point of its geographical distribution, more or less restricted geological range and intimate relationship with certain other scaly scallops.

Pecten kaneharai was first described by M. YOKOYAMA based upon several imperfect specimens collected by N. KANEHARA from his Zone 2 and 3 at Shicbara-machi in Tochigi Prefecture. These zones have subsequently been included into the Kanomatazawa formation (H. NIINO, 1933). According to M. YOKOYAMA it is difficult even to distinguish the right valve from the left, for they are so firmly attached to the stone that what we get are either casts or those with only their inner exposed. For such reasons his description was based upon a mould and a cast of the outer side which was obtained by dissolving the shell with weak acid. Subsequently YOKOYAMA (1931) described a specimen of a single right valve lacking the apical region, and referred it to the same species. This specimen was collected by F. KIRITANI from the Miocene strata (now known as Tanagura formation) developed in the vicinity of Tanagura-machi, Higashi-Shirakawa-gun, Fukushima Prefecture. From the above mentioned, it is clear that *Pecten kaneharai* YOKOYAMA is a confusing fossil scallop in the Neogene Tertiary of Japan, because its true characters are not well known.

The writer together with the students of the College of Education. Tohoku University, collected many beautiful specimens referable to *Pecten kaneharai* YOKOYAMA from the pebbly conglomerate of the Otsutsumi formation at Dôdokoro, and from the pebbly conglomerate of the Nanakita formation at Matsumori,

*Read June 26, 1954; received Sept. 5, 1955.

both in Izumi-mura, Miyagi-gun, Miyagi Prefecture in the northern border of Sendai.

The specimens studied by the writer in connection with this article, comprise those preserved in the collection of the Department of Geology, College of Education, Tohoku University, the topotype specimens and the others in the collection of the Institute of Geology and Paleontology, Faculty of Science, Tohoku University, those in the Saito Ho-on Kai Museum, Sendai, which are mostly from various localities in the northeastern Japan, and the topotype specimens in the collection of the Geological Institute, Faculty of Liberal Arts, Utsunomiya University, Utsunomiya City in Tochigi Prefecture. The results of examination are presented herein.

It may also be added that *kaneharai* occurs in strata having more or less similar lithology, that is to say, it is usually found in coarse-grained sediments. The writer attemped to analyse the paleoecological conditions of this species by making sedimentological studies of the Nanakita and Aoso formations in the northern border of Sendal City. These problems are dealt with in this article.

Acknowledgements are due to Dr. Kotora HATAI of the Department of Geology, College of Education, Tohoku University, for his kind supervision; to Mr. Jun AKUTSU of the Geological Institute, Faculty of Liberal Arts, Utsunomiya University, for his kind loan of the important specimens; and to some students of the College of Education, Tohoku University, for their assistance in the collection of this species.

Description

Family Pectinidae

Subfamily Pectininae

Genus *Chlamys* (BOLTEN) RÖDING, 1798

Chlamys kaneharai (YOKOYAMA)

Pl. 29, figs. 1—7.

1926. *Pecten kaneharai* YOKOYAMA, *Jour. Fac. Sci., Imp. Univ. Tokyo, Sec. 2, vol. 1, pt. 4,* p. 135, pl. 18, fig. 1, pl. 19, figs. 1, 2, 5, 6, 7.

1931. *Pecten kaneharai* YOKOYAMA, YOKOYAMA, *Op. cit., vol. 3, pt. 4,* p. 203, pl. 13.

1936. *Pecten (Chlamys) kaneharai* YOKOYAMA, NOMURA and HATAI, *Saito Ho-on Kai Mus., Res. Bull., no. 10,* p. 119, pl. 13, figs. 3, 4.

1937. *Pecten (Chlamys) kaneharai* YOKOYAMA, NOMURA and HATAI, *Op. cit., no. 13,* p. 127, pl. 18, figs. 1, 2.

1940. *Pecten (Chlamys) kaneharai* YOKOYAMA, NOMURA and ONISI, *Japan. Jour. Geol. Geogr., vol. 17, nos. 3-4,* p. 181, pl. 18, fig. 8.

YOKOYAMA's original description is as follows: Shell large, compressed, orbicular, somewhat inequivalve. Right valve slightly more convex than left, ornamented by more than 20 radiating ribs separated by valleys usually a little broader than the ribs themselves; ribs high and elevated, rounded, divided into three parts by longitudinal furrows with the middle part broader than the lateral ones and more elevated; valleys also with a single intercalary riblets; ribs as well as riblets closely scaled; ears unequal, anterior elongated, and provided with a few scaled radiating riblets and a deep byssal notch below, posterior triangular with lateral (posterior) side shortest. Left valve slightly flatter than right, with surface sculpture similar, but with the ribs usually bipartite instead of tripartite and intercalaries more prominent with occasionally a smaller intercalary between them and main ribs; ears both triangular.

The specimens collected by the writer with assistace of some students of the

College of Education, Tohoku University take the following description.

Shell large, moderately thick, orbicular, equilateral except for auricles, subequivalve, the left valve being a little more convex than the right, both valves radiately ribbed, and forming an angle of about 90° at apex.

Right valve with about 21 or a little more, distinct, imbricated, elevated radial ribs, and imbricated intercalary threads between the radial ribs; radial ribs nearly equal to their interspaces in breadth near the ventral margin, though a little narrower at about middle part of disc, and usually divided into three parts by two shallow longitudinal furrows on lower half of disc of them, the middle part is usually broader, more elevated and more imbricated than the lateral ones; rarely these divided radial threads are subequal, and near the submargins they may be divided into two parts by a shallow longitudinal furrow, or remain undivided, and very rarely they bifurcate near the beak, and in such a case no intercalary thread occurs in their interspaces; intercalary threads usually first appear at the upper half of disc and are subequal to the divided radials at the ventral margin; anterior auricle much longer and larger than the posterior, sculptured with a few imbricated radial threads and concentric lines, and furnished with conspicuous byssal notch and very wide byssal area; posterior auricle truncated behind at about right angle, and sculptured with several imbricated radial threads and with intercalary threads somewhat less distinct than the main radials, and concentric lines; hinge with conspicuous cardinal crura, ctenolium, and deep and wide resilial pit provided with lateral ridges at its upper half. Left valve with sculpture almost similar to the right, though rarely with faint subordinate intercalary threads in the interspaces between the radial ribs and main intercalary threads; anterior auricle with several imbricated radial threads and concentric lines, and larger than the posterior which is similarly sculptured; hinge provided with conspicuous cardinal crura and with socket corresponding to lateral ridges of resilial pit of right valve. Internal surface a little folded, corresponding to the sculpture of the external surface and with the very characteristic serration at the ventral margin.

Dimensions (in mm.):—

Valve	Right	Right	Right	Left	Left	Left
Height	123	ca. 104	ca. 100	95	92	90
Length	113	104	100	88	80	81
Hinge-length	72	65	63	57	ca. 50	52
Depth	21	21.5	19	20	ca. 17	19
Apical angle	90°	90°	90°	85°	90°	90°

Remarks:—This species is characterized by its larger and orbicular shell with about 21 distinct, imbricated and elevated radial ribs which are divided into three parts by shallow longitudinal furrows at the central part of the lower half of disc, of which the middle part is usually broader, more elevated and more imbricated than the others (or rarely subequal to the others). Imbricated intercalary threads, much larger anterior auricle, conspicuous ctenolium and cardinal crura, lateral ridges at the upper half of resilial pit, and the characteristic marginal serration in the inner surface of right valve are the features of this species. The sculpture of the left valve is almost similar to that of the right valve.

Among the features mentioned above,

the characters of the radial ribs are generally preserved in well preserved specimens, but in ill-preserved ones the sculpture is usually less distinct.

M. NAKAMURA previously noticed that among the specimens of *kaneharai* or specimens referable to the group of *kaneharai*, there are several types of radial ribs, and whether or not these several types of radial ribs fall in the limits of variation of a single species or should be treated as subspecies of the species is open to question. However, according to the writer's study these types of radial ribs are not clearly distinguishable from one another, though there are a few specimens which exhibit characters more or less diverging from the above given description of well preserved specimens. Therefore, the writer is lead to consider that the apparent differences of the radial ribs are probably due, in many cases, to the condition of preservation.

The topotype specimens (IGPS, coll. cat. no. 28317) collected by Hisakatsu YABE and Shiro TOYAMA, and the topotype specimens in the collection of the Geological Institute of Liberal Arts, Utsunomiya University are all ill-preserved, but the characteristic features of this species are still retained and can be observed, though with difficulty. The writer's specimens which are from the environs of Sendai are referable to the topotype specimens.

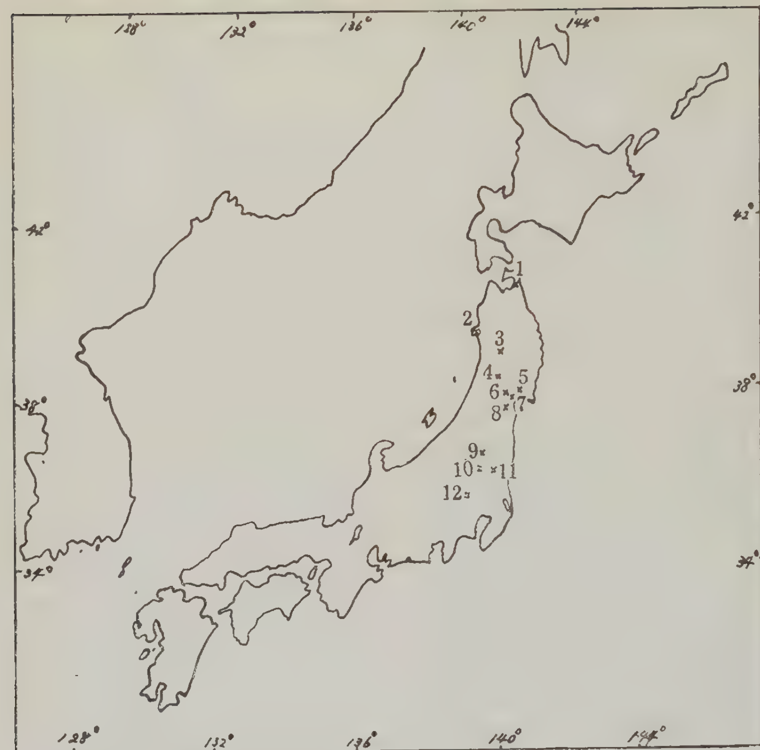
This species is closely related to *Chlamys miyatokoensis* (NOMURA and HATAI) described from the Miocene Ôtsutsumi formation in the northern border of Sendai. Although occurring in the same formation, *miyatokoensis* occupies a lower horizon than that of *Ch. kaneharai*. NOMURA and HATAI's species is distinguishable from the present one by ist decidedly smaller shell, finely scaled and low radial ribs which are equally separated into three or rarely four parts, two or three finely scaled intercalary threads in the interspaces, narrow byssal area, less distinct ctenolium and cardinal crura. A specimen figured by YOKOYAMA as *kaneharai* from the Miocene Tanagura formation is almost similar to *miyatokoensis* in sculpture, but it differs therefrom in having more distinct and more elevated radial ribs, and a much larger shell. In general features this species resembles *Chlamys meisensis* (MAKIYMA) from the Miocene Bankôdô formation, Kinshôdô in Northern Korea. However, *Chlamys meisensis* can be distinguished from the present one by having a larger number of radial ribs (23 to 27) which show folded topped, roundly edged and bifurcation, and less imbricated radial ribs. *Chlamys kaneharai* is also related to *Chlamys arakawai* (NOMURA) from the Miocene Tanosawa formation at Tanosawa, Ôdose-mura, Nishi-Tsugaru-gun, Aomori Perfecture, and *Chlamys ingeniosa* (YOKOYAMA) from the Miocene Nanao formation at Iwaya, Nanao City in Ishikawa Prefecture. But *kaneharai* is distinguishable from those two species by the number and characters of the radial ribs, and by the cardinal crura, though the latter species shows an almost similar aspect. *Chlamys kakisakiensis* (NOMURA and NIINO) described from Shirahama formation (Pliocene Harada formation of K. WATANABE et al., 1952) at Kakisaki in Izu Peninsula also resembles this species in shell form, more or less scaly radial ribs which are divided into three parts, and by the about 85° of apical angle. But the present one differs from that species by having 26 radial ribs, and no intercalary thread in the interspaces, though rarely they are present near the ventral mar-

gin in the full adult specimens. Another similar species is *Chlamys iwakiana* (YOKOYAMA) from the Shirado formation (referred to the Miocene Kokozura formation by K. HATAI and S. NISIYAMA) at road cutting between Tateishi and Shiogu, Tatsuta-mura, Futaba-gun in Fukushima Prefecture. However, it is distinguishable therefrom by the more scaly, undivided, narrower radial ribs, and by the marginal serration. This species also resembles *Chlamys ashiyaensis* (NAGAO) and *Chlamys ashiyaensis* var. *denslineata* (NAGAO), both which have been described from the Oligocene Yamaga formation at Ashiya-machi and its environs, Onga-gun, Fukuoka Prefecture in Northern Kyûshû, Japan. However, those species differ from the present one in the characters of the radial ribs which are slightly elevated and much narrower, and by the less number of radials. Among the foreign species, those which resemble *kaneharai* are, *Chlamys (Lyropecten) madisonius bassleri* TUCKER from the Miocene Calvert formation and *Chlamys (Lyropecten) acanikos* (GARDNER) from the Miocene Chipola formation, both of the Atlantic Coast of United States of America. However, they may be distinguished from *kaneharai* by their thin shell, less number of radial ribs (17), narrow byssal area, and closely spaced intercalary threads. *Chlamys hericius* (GOULD), a Recent species of the North-western Pacific and occurring as fossil in the Pleistocene, Pliocene and upper Miocene formations of California, is related to this species in the shell form and the characters of radial ribs which are divided into finely scaled three parts, but that shell differs from the present one in having a smaller shell, much more scaly radial ribs, several intercalary threads between the radial ribs, and the much narrower channels between the divided threads.

Geological Significance

Chlamys kaneharai (YOKOYAMA) shows a rather wide geographical distribution in the Japanese Neogene Tertiary (Text-figure). The lithology of the strata in which this species has been reported to occur is more or less similar, that is to say, *Chlamys kaneharai* bearing rocks are usually of conglomerate or very coarse-grained sandstone without or with little silt.

To understand the environmental conditions of deposition of the strata embedding *Chlamys kaneharai* the writer made a sedimentological study of the lowermost part of the Nanakita formation which contains its abundant remains. Simultaneously, it was considered important to also know the conditions of deposition of the upper part of the Aoso formation with which the Nanakita is continuous. The Nanakita formation which is widely developed in the northern border of Sendai City, conformably overlies the white, massive pumiceous tuff of the Aoso formation which contains fossil shells and gravels sporadically; the fossil shells usually occur as fragments or isolated valves. The white pumiceous tuff is about 6 meters in maximum thickness at Nagashiba, Tomiya-mura, Kurokawa-gun near the central part of the said area, but gradually decreases its thickness in all directions therefrom. Where the pumiceous tuff thins out, the conglomerate at the base of the overlying Nanakita formation comes into direct contact with the sandstone of the Aoso formation. With the decrease in thickness of the tuff southwards, its contained gravels tend to increase in number, size and



Text-fig. Map showing the distribution of *Chlamys kaneharai* (YOKOYAMA). 1, Gamanosawa and Yagen formations. 2, Nishikurosawa formation. 3, Kanazawa formation. 4, Ginzan formation. 5. Oido formation. 6, Ôtsutsumi formation. 7, Aoso and Nanakita formations. 8, Moniwa formation. 9, Nakayama and Shirakata formations. 10, Kanomatazawa formation. 11, Tanagura formation. 12, Tomioka and Itahana formations.

roundness, and the long axis of the gravels are arranged parallel with the base of the tuff. The contained shells also tend to increase in their number, and are arranged at the base with the convex side upwards; such a tendency was observed in northward direction. From the above mentioned data it may be considered that the pumiceous tuff in the southern part of the area was more influenced by water action than that in the northern part. The pumiceous tuff overlies the sandstone and granule conglomerate with relatively sharp boundary, and their lower parts usually show planar cross-stratification (E. D. McKEE and G. W. WEIR, 1953) without truncation. From the results of mechanical analysis of the sandstone, which was sampled from stratum in direct contact with the overlying tuff, it was found that median diameter usually tended to increase in size towards the south, and the degree of sorting became poor in the same direction, though there are patchwise anomalies of the median diameter and sorting coefficient. The directions of cross-stratification of the

lower part of sandstone usually show low angle towards the south or southwest. It may be considered that the water which deposited the upper part of the Aoso formation probably moved from north to south, and the coarse materials showing the large median diameter and large sorting coefficient at the southern part were probably lag materials.

The lower part of the Nanakita formation is characterized by the shell bearing pebbly conglomerate, which comprises well water worn pebbles, rarely with boulders, or granule conglomerate, but sometimes it may consist of medium to coarse-grained sandstone with no shells. The thickness and assemblages show some difference locally, though *Ch. kaneharai* is a common species in general. At Matsumori, Izumi-mura, Miyagi-gun, many specimens of *kaneharai* occur in the pebbly conglomerate of the lowermost part of the Nanakita formation (about 150 cm. in thickness) associated with abundant molluscan shells. This conglomerate gradually changes into granule conglomerate then into conglomeratic sandstone laterally and to coarse- to medium-grained sandstone upwards. The specimens of *kaneharai* in the conglomerate gradually decrease in number towards the upper, and is replaced in the upper sandstone, which is characterized by having *Miyagipecten matsumoriensis* MASUDA, *Mya japonica* JAY and others which do not appear in the mentioned conglomerate. In general, all of the kinds of fossils found in the mentioned conglomerate tend to disappear upwards, and the fossil assemblage shows a nearly complete change in the upper sandstone. However, the fossils in the sandstone are restricted in their distribution to Matsumori and nearby.

Although the fragments of *Ch. kaneharai* are sporadically contained in the tuff of the Aoso formation, well preserved specimens are abundantly found in the conglomerate of the Nanakita formation, though almost all of them occur as isolated valves. From the aforementioned data, it appears that *Ch. kaneharai* in the conglomerate may have been transported from the sites of living to that of deposition after death, which is thought to be a relatively short distance by the action of water, and that the latter factor is closely related with the deposition of the upper part of the Aoso formation.

From the above mentioned, the writer considers that *Chlamys kaneharai* flourished in a shallow clean sea bottom which was not supplied with muddy materials.

The writer's results support the view of K. HATAI and M. NAKAMURA who concluded that the deposition of the conglomerate of the lowermost part of the Nanakita formation was one of a shallow sea, judging from the mode of occurrence of *Glycymeris matumoriensis* NOMURA and HATAI. Details on the sedimentation of this region are expected to be published at another opportunity.

In the northern border of Sendai the occurrence of *kaneharai* is restricted to the middle part of the Ôtsutsumi and Aoso formations and to the lowermost part of the Nanakita formation. However, throughout these formations, the writer could observe no morphological differences among them.

As to the geological age of this species, it may be stated from the evidence that all these mentiond formations are Miocene, the writer considers that the geological range of *Chlamys kaneharai* (YOKOYAMA) is restricted to the Early

Miocene in a twofold division, or more precisely from Lower to Middle Miocene in a threefold classification.

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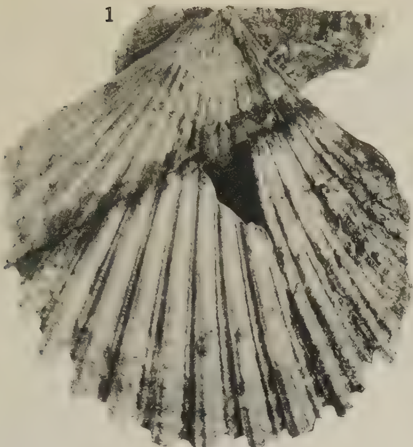

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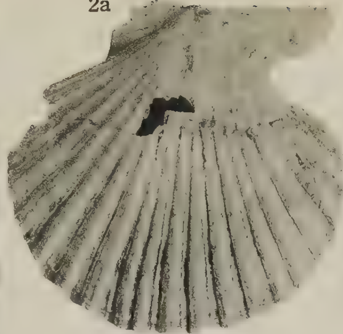

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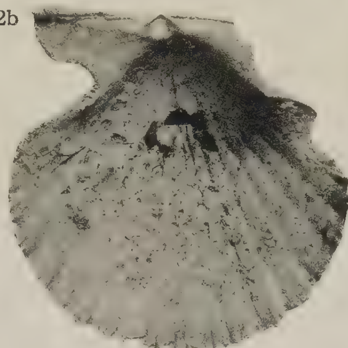

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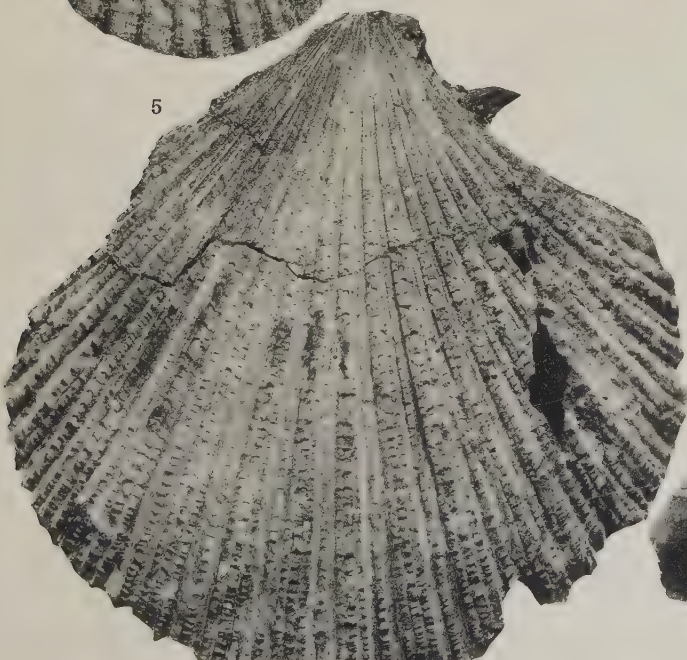

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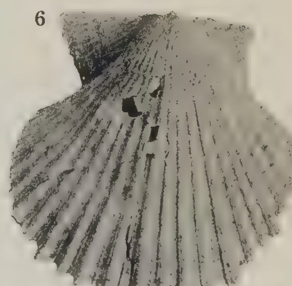

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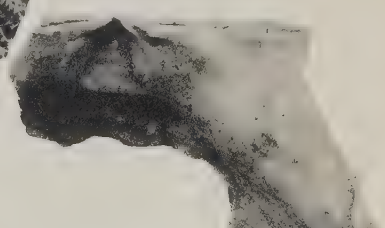

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Explanation of Plate 28

Chlamys kaneharai (YOKOYAMA)

Fig. 1. Right valve, ×1/2. SM*. Reg. No. 2632. Loc. Matsumori, Izumi-mura, Miyagi-gun, Miyagi Prefecture (Nanakita formation).

Figs. 2a–b. a. Right valve, ×1/2. b. Internal view of 2a, ×1/2. Reg. No. 1977. Loc. Dôdokoro, Izumi-mura, Miyagi-gun, Miyagi Prefecture (Ôtsutsumi formation).

Fig. 3. Right valve, ×1/2. Reg. No. 1992. Loc. Matsumori, Izumi-mura, Miyagi-gun, Miyagi Prefecture (Nanakita formation).

Fig. 4. Hinge area of right valve, ×1. Reg. No. 1993. Loc. Same as above.

Fig. 5. Right valve, ×1. Reg. No. 1976. Loc. Same as above.

Fig. 6. Left valve, ×1/2. Reg. No. 1980. Loc. Dôdokoro, Izumi-mura, Miyagi-gun, Miyagi Prefecture (Ôtsutsumi formation).

Fig. 7. Hinge area of left valve, ×1. Reg. No. 1980. Loc. Same as above.

SM* = Abbreviation for Saito Ho-on Kai Museum, Sendai.

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287. ON THE VARIATION OF *LIMA* (*ACESTA*) *GOLIATH* AND ITS ALLIED SPECIES, WITH THE DESCRIPTION OF A NEW SPECIES*

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オオハネガイおよびその近縁種の変異について,附, 1 新種の記載: 日本の新生界から報告されている, オオハネガイ亜属の近縁種 4 種について, 第 1 図に示すような測定の方法を用いて, 殻形の特ちようをしらべた。その結果, 殻形に 3 つの型がみとめられ, とくに, 従来あまり報告されていなかつた, 幅の広い, 丸い型のあることを指摘した。私が, 岩手県北部の門の沢層 (中新統) の泥岩から採集した標本は, あきらかに, 丸い型を示し, 二ノ戸地区では, 生態的にもオオハネガイと異つているので, *Lima* (*Acesta*) *omorii* という新種名を与え, 記載を行つた。　青 木 滋

From the Cenozoic deposits of Japan many species of *Lima* (*Acesta*) have been described, but their details have remained unknown owing to that the methods employed for measurement and to that material for comparative morphological observations have not been adequate.

The species hitherto recorded as occurring from the Cenozoic deposits are the following,

1. *goliath* SOWERBY, 1883 (Miocene to Recent)
2. *yagenensis* OTUKA, 1939 (Oligocene to Pliocene)
3. *nagaoi* OYAMA, 1951 (Oligocene)
4. *nishiyamai* (YOKOYAMA), 1911 (≒*L.* (*A.*) *eocenica* NAGAO, 1928) (Upper Eocene)
5. *smithi* SOWERBY, 1888 (Oligocene to Recent)
6. *j-suzukii* TAKEDA, 1953 (Oligocene)
7. *amaxensis* NAGAO, 1911 (Upper Eocene)
8. *kumasoana* NAGAO, 1928 (Upper Eocene)

Of the listed species, the first four appear to be closely related with one another in general features, such as outline, convexity, strength of surface sculpture and size. Of them, *Lima yagenensis*, which was named by Y. OTUKA (1939, p. 27) for a shell from the Miocene Yagen formation of Shimokita Peninsula, Aomori Prefecture, is considered by him to be identical with the *Lima goliath* identified by M. YOKOYAMA (1925–B, p. 123, pl. 14. fig. 11) from the Oligocene Akahira formation of the Chichibu Basin, Saitama Prefecture. Subsequently, K. OYAMA (1943, p. 42) stated that the *Lima goliath* recorded by M. YOKOYAMA (1925–A, p. 26, pl. 3, figs. 1, 4) from the Miocene Shirado formation of the Joban coal-field in Ibaragi and Fukushima Prefectures, is also identical with *yagenensis*. All the specimens from the three localities have in common the antero-ventrally extended shell outline and large dorsal angle, and by such features they have been distinguished from the Recent *Lima goliath*. *Lima nagaoi* was named for a specimen reported as *Lima goliath* by M. YOKOYAMA

* Read June 18, 1955; received Oct. 3, 1955

(1927, p. 188, pl. 50, fig. 1) from the Oligocene deposits of Kyushu, and is stated to include the *Lima* aff. *goliath* recorded by T. NAGAO (1928, p. 40, pl. 6, figs. 17–19) from the Oligocene Ashiya group of Kyushu. This species is said to be distinguishable from *Lima goliath* by its less height and greater length, according to K. OYAMA (1951, p. 56). *Lima nishiyamai* was originally described by M. YOKOYAMA (1911, p. 7, pl. 1, figs. 1a–b) under the generic name of *Perna*, and is said to be distinguishable from *Lima goliath* by the less convex shell, less height and greater length with shorter antero-dorsal margin and more broadly rounded posterior end.

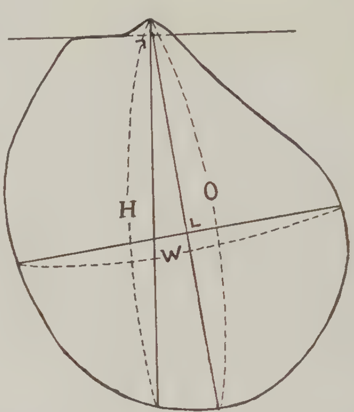
The shells of the mentioned four species are characterized by being oblique, longitudinal-ovate and antero-ventrally or ventrally extended in shell outline. Their surface sculpture, however, closely resembles one another, and for this reason, they were selected as the basis for study. The other four species have stronger surface sculpture and therefore, were omitted from the recent consideration.

Recently I collected an unusual form of *Lima* (*Acesta*) from the Miocene Kadonosawa formation in the Ninohe District, Iwate Prefecture, during my field work on the geology of the said region. This specimen resembles *Lima goliath* and its allied species from Japan, but is more rounded in form.

Paleontological observations were made on the form variation of *Lima* (*Acesta*) *goliath* and its allid species, with particular attention to the new species which is described in this paper.

Method of Measurement

Owing to that the shell outline of *Lima* is generally so oblique that the usual method of measurement is unreliable as to the true form or shape of the shell, I have employed the following method for its measurement, namely (Text-fig. 1):—



Text-fig. 1. H: Height O: Obliquity
W: Width

Height (H):—Diameter from the tip of the umbo to the opposite margin in a direction of right angle to the dorsal margin of the posterior ear.

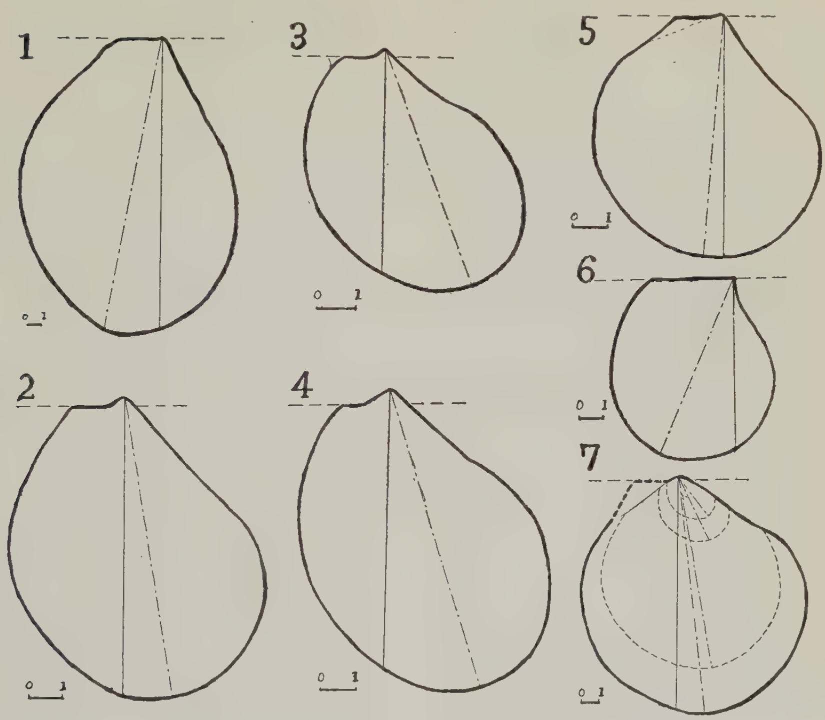
Obliquity (O):—Maximum diameter from the tip of the umbo to the farthest point on the margin.

Width (W):—Maximum diameter in a direction of right angle to that of obliquity.

Of the three diameters, the value of Obliquity has already been discussed by W. J. ARKELL (1926, p. 196), and here I take the Width of shell instead of Length, because the value of the latter varies according to the degree of obliquity of the shell. In this paper, the characteristics of the shell form are represented by the correlation between O/H and O/W.

Results of Examination

The specimens examined, about



Text-fig. 2. Types of shell form of *Lima* (*Acesta*)

Type 1-a 1: Recent *Lima* (*A.*) *goliath* SOWERBY

2: Fossil *Lima* (*A.*) *goliath* SOWERBY from the Miocene Suenomatsuyama formation, Iwate Prefecture.

Type 1-b 3: *Lima* (*A.*) *yagenensis* OTUKA from the Oligocene Akahira formation, Chichibu Basin, Saitama Prefecture.

Type 2 5: Specimen from the Oligocene Akahira formation, Chichibu Basin, Saitama Prefecture.

6: *Lima* (*A.*) *nishiyamai* (YOKOYAMA) from the Oligocene Ashiya Group, Fukuoka Prefecture.

7: *Lima* (*A.*) *omorii* AOKI from the Miocene Kadonosawa formation, Iwate Prefecture.

thirty in number, are preserved in the Institute of Geology and Mineralogy, Tokyo University of Education, the Institute of Geology, Tokyo University, and the Geological Survey of Japan. Type specimens were not all accessible for actual examination, therefore, I have made measurements from the figured types.

From the results of examination, I have found three types of shell form in the *Lima* (*Acesta*) *goliath*-group. (Text-fig. 2)

Type 1-a. Shell is narrower that the Type 2, less oblique than that of the Type 1-b, and extends ventrally. O/W=1.15—1.5, O/H =1.0—1.05.

Type 1-b. Shell is narrower than the Type 2, more oblique than that

of the Type 1–a, and extends antero-ventrally. O/W=1.15–1.35, O/H=1.10–1.14.

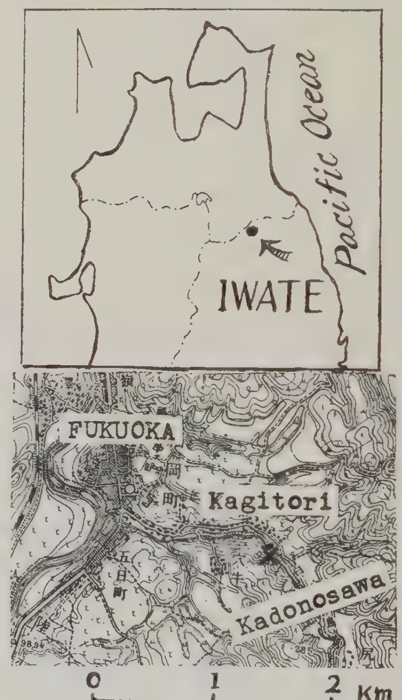
Type 2. Shell is wider than the above two, round and less oblique. O/W=0.95–1.08, O/H=1.00–1.04.

The general form of *L.* (*A.*) *goliath* belongs to Type 1–a and that of *L.* (*A.*) *yagenensis* to Type 1–b, and their differences are chiefly in the degree of obliquity of the shell. It should also be stated that specimens of Recent aud fossil *L.* (*A.*) *goliath* can be distinguished from one another in their form of growth. In the fossil *L.* (*A.*) *goliath* the maximum Obliquity is anterior to the line indicating the Height, while in the Recent specimens the reverse is the case. The shells belonging to Type 2 are quite distinct from those of the other types and are represented by *L.* (*A.*) *nishiyamai* and the new species to be described in this paper. Another orbicular type occurs in the Akahira formation in the Chichibu Basin, Saitama Prefecture; this may also represent a new species. It also occurs in the Ashiya Group of northern Kyushu, under the name of *L.* (*A.*) *nagaoi* which is a species in need of further study.

Although it is not clear whether the above-mentioned types of the shell form in *Lima* (*Acesta*) have relation with the evolutionary trends of the subgenus, it is at least evident that orbicular adult shell was derived from a more oblique, narrower and antero-ventrally extended young. Further, so far as present data permits, it is also evident that orbicular forms of *Lima* (*Acesta*) are unknown from Pliocene or younger deposits, while they are not uncommon in those of Miocene or older. Such features may have relationship with the phylogeny of the subgenus.

Occurrence and Ecological Notes on *Lima* (*Acesta*) *omorii* AOKI, n. sp

The new species was collected from the pumiceous siltstone of the Shikonai member of the Kadonosawa formation, at the fossil locality shown in Text-fig. 3. The Kadonosawa formation is typically exposed along the Shiratori River,



Text-fig. 3. Map showing the fossil locality of *Lima* (*A.*) *omorii* AOKI, Iwate Prefecture.

where it can be subdivided into three lithological units, namely conglomeratic sandstone, claystone and siltstone with intercalated layers of tuff, and silty very fine-grained sandstone in ascending order. Of these, the latter two rocks are typical of the Shikonai member and they contain abundant molluscan assem-

blages in various horizons (AOKI, S., 1955). The details of the stratigraphy and paleontology of this district will be given at another opportunity.

The new species is associated with the *Macoma-Patinopecten* assemblage, which is characterized by the abundant occurrence of *Macoma optiva* (YOKOYAMA) and *Patinopecten kimurai* (YOKOYAMA), with rare or few occurrence of *Acila* (*Acila*) *submirabilis* MAKIYAMA, *Anadara* aff. *abdita* (MAKIYAMA), *Venericardia siogamensis* NOMURA, *Panope japonica* A. ADAMS, *Lucinoma acutilineata* (CONRAD), *Cultellus izumoensis* YOKOYAMA, *Macoma* aff. *tokyoensis* MAKIYAMA, *Portlandia* (*Portlandella*) spp., *Clinocardium* cf. *shinjiense* (YOKOYAMA), *Clementia* (*Compsomyax*) cf. *iizukai* (YOKOYAMA), *Fulgoraria* sp. indet., *Neptunea modesta* (KURODA), *Ancistrolepis* sp. indet., and *Buccinum* sp.

These shells, especially of *Macoma*, show a crowded mode of occurrence in the pumice-rich part of the siltstone, and the fossils are scattered sparingly or sporadically throughout in the pumice-poor part of the rock. The specimens of *Macoma* in the crowded portion occur with the shell intact or isolated, while *Cultellus* and *Panope* occur in natural position. The left valve of the new species was collected from the pumice-poor part of the siltstone. The surface ornamentation of the shell, which was unfortunately broken at the time of collecting, was well preserved and shows no indication of being worn.

From the above-mentioned evidence and undisturbed sedimentary feature of the strata in which fossils were embedded, the majority of the species of this assemblage may be autochthonous or subautochthonous, in spite of its crowded mode of occurrence, which may be explained by the mass killing caused by deposition of the volcanic materials on the ancient sea bottom.

In the Ninohe district, although the occurrence of the present new species seems to be restricted to the Kadonosawa formation, *L.* (*A.*) *goliath* SOWERBY occurs rather commonly in the overlying Suenomatsuyama formation and very rarely in the Kadonosawa formation, from which a single questionable immature shell was collected. *L.* (*A.*) *goliath* was found in the fine- to medium-grained sandstone and conglomeratic sandstone of Suenomatsuyama formation, in association with abundant or common shells of *Patinopecten* spp., *Chlamys* spp., *Volsella difficilis* KURODA et HABE, *Lucinoma acutilineata* (CONRAD), *Septifer* n. sp. and others.

From the respective associated fauna and lithology, the ecological environments of the above two species may be distinguished from each other.

Description of New Species

Family Limidae

Genus *Lima* BRUGUIÈRE, 1797

Subgenus *Acesta* H. and A. ADAMS, 1858

Lima (*Acesta*) *omorii* AOKI, n. sp.

Pl. 29, Fig. 1

Shell (left valve) large in size, moderately thick, convex, suborbicular, slightly oblique, inequilateral; posterior and anterior ends broadly rounded, ventral margin slightly arcuate, posterodorsal margin nearly straight, long; beak prominent overhanging ligamental pit; posterior ear fractured, but perphaps small, anterior ear invisible; surface, according to the field observations, ornamented with numerous fine, undulating radial lines, except near the

anterior and posterior margins where there are narrow areas covered by rather strong radial ribs. The immature form of the shell is more oblique, antero-ventrally extended and narrower in shape.

Measurements:-(in mm.)
Height 136, Obliquity 138, Width 129, Thickness 58.

Comparison and Remarks:-Two specimens lacking the greater part of the shell. The present new species is characterized by its large size and sub-orbicular or orbicular outline of the shell. As already mentioned, this species resembles *L.* (*A.*) ***nishiyamai*** (YOKOYAMA) and *L.* (*A.*) ***nagaoi*** OYAMA, but is distinguishable therefrom by having shorter antero-dorsal margin and more orbicular form of the shell. Another allied species is ***Lima oregonensis*** CLARK (1925, p. 84, pl. 14, figs. 3, 4) from the Oligocene Keasey formation of Oregon, but it has a longer antero-dorsal margin of the shell than that of this new species. It must be also stated that there are some closely allied species of ***Lima*** in the Cretaceous of England.

The specific name is given in honor of Mr. Masae ÔMORI, who gave me many suggestions with regard to problems on paleontology.

Locality and Horizon:-A river-side exposure of the Shiratori River, about 50 m. immediately southeast of Kagitori, Nisatai-mura, Ninohe-gun, Iwate Prefecture. Shikonai member of the Kadonosawa formation, Miocene. Reg. No. 15001.

Acknowledgements

I wish to record my thanks to Professor Kotora HATAI for his supervision and reading of this manuscript. Acknowledgements are also due to Messrs. Masae ÔMORI, Saburo KANNO and Katsumi HIRAYAMA of our Institute for their kind encouragement. I also thank Messrs. Sunao OGOSE of the Tokyo University and Atsuyuki MIZUNO of the Geological Survey of Japan, for the permission to examine the specimens in the collections of those institutes.

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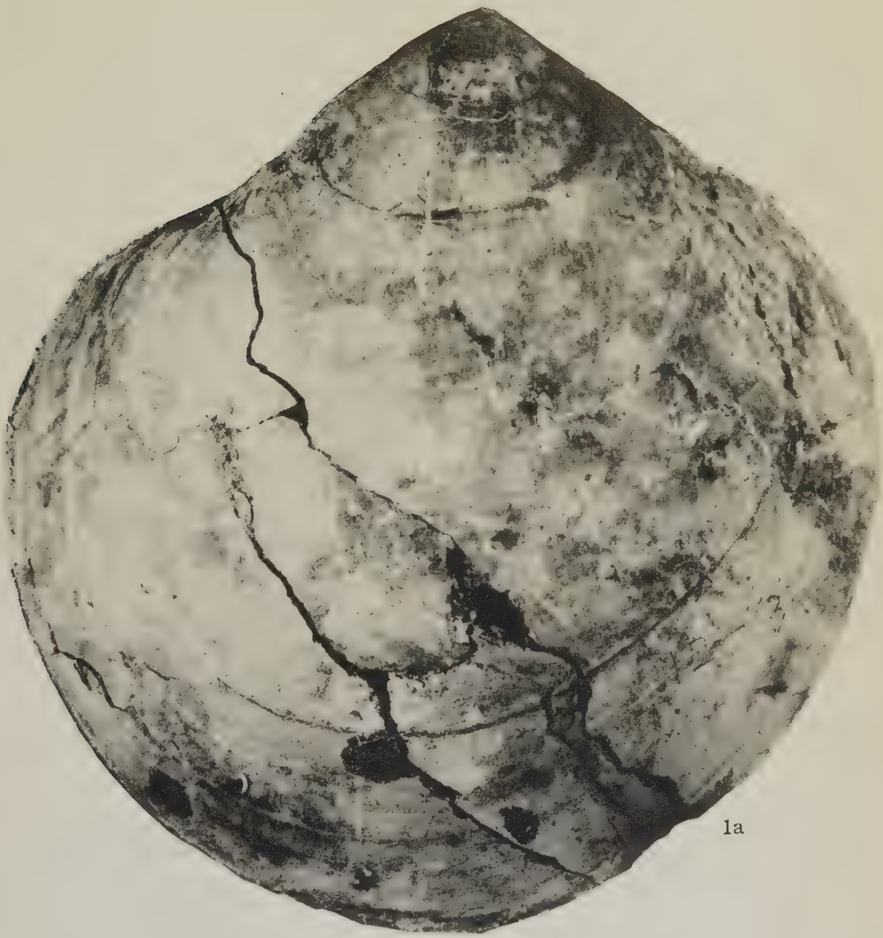

1a

1b

Explanation of Plate 29

Figs. 1-a,b. *Lima* (*Acesta*) *omorii* AOKI, n. sp.
Upper and side views (nearly natural size) Reg. No. 15001, coll. Tokyo Univ. Educ.; Kagitori, Nisatai-mura, Ninohe-gun, Iwate Prefecture. (phot. by S. AOKI)

Trans. Proc. Palaeont. Soc. Japan, N. S., No. 22, pp. 191—194, June 30, 1956

288. A NEW SPECIES OF *DAMESITES* FROM THE CENOMANIAN OF HOKKAIDO, JAPAN

(Studies on the Cretaceous Ammonites from Hokkaido and Saghalien-IX)*

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and

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北海道セノマニアン産の *Damesites* 新種: *Damesites* は日本とその近縁地区のセノニアンに多い菊石属だが，セノマニアンに相当する部分にも，先祖型のものが，稀ながら産することがわかつた。それは北海道幾春別川沿いの三笠層の *Desmoceras japonicum* 帯に唯一つ産したものであるが，*D. laticarinatus* という新種を代表すると認められるので，その記載を行う。これは *Desmoceras kossmati-D. poronaicum* の系統とつながりがあると推定されうる諸性状をもつ。なお最近北米にもこれと近似（但し別種）者が産することがわかりかけてきた。これらの事実から，Desmoceratidae 科の発達史についての知識は，いくらか修正する必要が生じた。すなわち，*Damesites* はセノマニアンには既に *Desmoceras* から分化しており，*Tragodesmoceroides*・*Tragodesmoceras* とはむしろ平行的の関係にあつたとみなす方が，妥当となつてきた。

斎藤林次・松本達郎

Introduction

Damesites is a genus of Desmoceratidae which is very common in the Upper Cretaceous of Japan and adjoining areas. It is represented in the Urakawan (approximately Coniacian-Santonian-Lower Campanian) by *D. damesi* (JIMBO), *D. semicostatus* (YABE MS) MATSUMOTO and *D. sugata* (FORBES) and in the Hetonaian (Upper Campanian-Maestrichtian) by *D. hetonaiensis* (SAITO MS) MATSUMOTO. Therefore the genus has been considered as ranging throughout the whole period of the Senonian (T. MATSUMOTO, 1954a). However the specimens coming from the Lower Urakawan are so numerous that the possibility of the earlier appearance of a forerunner has been a question to be settled.

One of us (R. S.) once discovered a specimen which could be assigned to *Damesites* from the Cenomanian of Hokkaido, but has left it undescribed because of its too solitary occurrence. On the other hand specialists in foreign countries have laid special attention to *Damesites* since the genus was monographically described in Japan. Thanks to the kind personal communications and gifts of the plaster casts of American specimens from Dr. COBBAN of U. S. Geological Survey and from Mr. CONLIN in Texas we are now inclined to consider it reasonable that the genus begins to appear at the latest in the Cenomanian. The description of the American species is now under preparation by Dr. COBBAN. Following his kind advice we describe here the Japanese form in question.

* Read June 18, 1955; received Oct. 29, 1955

Systematic Description

Family Desmoceratidae

Genus *Damesites* MATSUMOTO, 1942

Damesites laticarinatus sp. nov.

(Text-figs. 1—4)

Material.—A single specimen provided with a probable body chamber, a half of which is destroyed away, holotype, R. SAITO Coll.

Specific diagnosis.—Fairly small, much involute, narrowly umbilicate and discoidal shell. Whorls are compressed, with height increasing more rapidly than breadth. Venter is arched and provided with a smooth median keel, which has a broad base and rather obtusely angular top. Flanks are very gently convex in the outer whorls which are broadest slightly above the mid-height. Umbilicus is crater-like, with a subrounded margin and a steep or nearly perpendicular wall.

Surface of the shell is nearly smooth and only faintly striate. The striae are gently flexuous on the flanks and show a prominent forward bend on the venter. Faint longitudinal ornaments are discernible on the well preserved shell.

Sutureline is of typical *Desmoceras* pattern and has relatively narrow and deeply incised lobes, much resembling that of *Desmoceras kossmati* MATSUMOTO (T. M., 1954a, p. 251, text fig. 1 (47)).

a b c

Text fig. 1. *Damesites laticarinatus* sp. nov.
Lateral (a) and ventral (b) views and a restored whorl-section (c), natural size. Holotype from the Mikasa formation of the Ikushumbets valley, Ishikari Province, Hokkaido (R. SAITO Coll.).

Measurements.—

	Diameter	Height	Breadth	(B/H)	Umbilicus	(%)
Maximum (approximation)	77	43	27	(0.63)	7	
Relatively undeformed part of body whorl	—	40.0	25.4	(0.63)	—	
Inner whorl	35.2	20.5	15.6	(0.76)	3.4	(9.6)

Comparison.—The specimen in question resembles in shell-form *Damesites damesi* (JIMBO) (1894, p. 26, pl. i, figs. 2, 2a, 2b, 3; MATSUMOTO, 1954a, p. 267, pl. v (xxi), figs. 1a–d, 2a, b, 3a, b and text figs. 10, 11 [56, 57]), the type species of the genus, being only slightly more compressed, when the shells of the corresponding size are compared. The remarkable distinction is in the broadness of the keel and in the absence of the subcostae in the present form. The furrows on both sides of the keel are distinctly developed in the typical *Damesites damesi* but are fairly weak in some individuals of the same species. In the present form very shallow longitudinal depressions are discernible on both sides of the broad base of the keel.

Thus, in spite of the solitary occurrence, the specimen in question clearly represents a new species, which has some affinity with *Damesites damesi*.

Desmoceras (*Pseudouhligella*) *japonicum* YABE, which occurs adundantly in the same bed as the present species, has wider umbilicus, angular umbilical wall, flattened flanks, frequent constrictions and no keel. In the narrowness of the sutural elements, infrequency of the constriction and gentle convexity of the flanks the present species may have closer connexion with the series of *Desmoceras kossmati* MATSUMOTO–*Desmoceras* (*Pseudouhligella ?*) *poronaicum* YABE (*see* MATSUMOTO, 1954a, p. 260) than to that of *Desmoceras latidorsatum* (MICHELIN)–*D.* (*P.*) *japonicum* YABE.

An American form from U. S. G. S. Mesozoic loc. 22871, six miles northwest of Alzanda, near top of Belle Fourche shale, probable Upper Cenomanian, which is to be described by Dr. COBBAN, is very similar to ours in its broadness of the keel and other points, but its keel is rounded on top and weakly serrated, owing to the intersection with the striae or riblets, and its flexuous striae are more distinct and distant in a certain limited growth-stage, resulting in the close-set riblets. Another American form from the Bluebonnet member, Eagle Ford formation of McLennan County, Texas, a plaster cast of which has been kindly sent to one of us (T. M.) from Mr. CONLIN, is allied to ours in general aspects but its keel seems again to be broadly rounded.

Occurrence.—Rare in the dark coloured calcareous nodule in the Mikasa formation (=the so-called *Trigonia* Sandstone) along the main course of the Ikushumbets, Ishikari Province, Hokkaido. Zone of *Desmoceras* (*Pseudouhligella*) *japonicum*, Cenomanian.

Concluding Remarks

The present discovery is interesting to the evolutional history of *Damesites* and also to that of Desmoceratidae. From the species described above (and also from the American forms) it now becomes evident that *Damesites* begins to appear in the Cenomanian. From this fact and from the morphological resemblance (as well as the ontogenetic development of the characters) the origin of *Damesites* is more likely sought in *Desmoceras*, a world-wide genus in Albian and Cenomanian.

Tragodesmoceroides and *Tragodes-*

moceras, peculiar members of Desmoceratidae (see T. M. 1954a, 1954b), may not be a direct ancestor of *Damesites*, but may be parallel developments. We could expect to find the forerunners of these two genera in the Cenomanian too.

Comparing the species of *Damesites* in the successive zones of the Upper Cretaceous, we find a general tendency that the ventral keel, which is an important generic character, is at first low and broad, in the main period moderate or very strong and lastly very narrow and small. Similarly the surface ornamentation is at first weak, in the main period typically distinct and finally obsolete. However for a precise tracing of the lineage more collections are wanted.

In conclusion we express our particular thanks to Doctor W. A. COBBAN of U. S. Geological Survey in Denver, Mr. J. P. CONLIN in Texas and Mr. C. W. WRIGHT in London for their friendly helps to our study. The photographs have been taken by one of us (T. M.) with kind assistance of Mr. I. OBATA.

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Trans. Proc. Palaenot. Soc. Japan, N. S., No. 22, pp. 195—203, June 30, 1956.

289. ON THE MUTATION OF *TEREBRATALIA COREANICA* (ADAMS AND REEVE) FROM A CONCHOMETRICAL POINT OF THE VIEW*

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計測的見地より見たる *Terebratalia coreanica* の mutation に就いて：現生及び化石種の腕足類 *Terebratalia coreanica* (ADAMS and REEVE) の殻長，殻幅そして殻の脹らみを計測し，当種の殻の発達には陸奥湾産現生種に見られる transverse なものと，千葉県産化石種に見られる elongate なものと二型ある事を認め，この化石種を WAAGEN の古生物学上の mutation とする。而して，これが地理的な変異種であるか，又は ecotype 或は cline なものであるかは尚十分な資料を要する。

古 藤 次 郎

With regard to the Recent and Neogene Brachiopoda of Japan, Dr. Kotora HATAI has already published many papers. However, concerning the variation of brachiopods, there are but few works, therefore the writer desires to present the results of his observations on the variation of *Terebratalia coreanica* (ADAMS and REEVE), which he collected from the fossil zones in Umadate, Koda-mura, Ichihara-gun, and Jizodo, Makuda-mura, Kimitsu-gun, Chiba Prefecture. He also wishes to show the relation thought to exist between the Recent and fossil specimens of the named species.

Here the writer wishes to offer his hearty thanks to Dr. K. HATAI for allowing him to study the specimens preserved in the Institute of Geology and Paleontology, Tohoku University, and for his encouragements. Acknowledgement should be made to Dr. S. IJIRI for his critical views.

*Read Dec. 19, 1954; received Sept. 28, 1955

Terebratalia coreanica (ADAMS and REEVE) dates back to the Miocene and possibly may also occur in pre-Miocene deposits. The geographical distribution is from the Strait of Chosen (Korea) north to the Tsugaru Strait including Mutsu Bay of Aomori Prefecture, from where it ranges southwards to the Boso Peninsula along the Pacific Ocean. It is also known from the Amakusa Island in Ariake Bay, Kyushu, and Tsingtao, China. It is known to have a bathymetric range from 12 or less to 150 or more fathoms, and to flourish on a muddy bottom intermixed with some sand (fine grained but not coarse).

With respect to the shell-outline of this species, Dr. K. HATAI has already said, "It appears that there is a tendency in the young stage to take to a transverse development in shell-outline, although there exists more orbicular forms. This tendency to transverse development is gradually transferred into one with a more orbicular development. In the adult stage, specimens

having such a transverse outline as those of the young are seemingly rare, the majority having attained a more orbicular outline. The adult stage presents a large number of varied forms (shell-outline), the most extreme types or outline being the transverse and elongate ones with the intermediate forms supplementing the intervening area." He recognized the transformation during the developments of the shell-outline from the young to the adult stages. The writer also considers the existence of the two types away the Recent and fossil specimens of this species in Japan, for which reason he has undertaken a Conchometrical analysis of the valves.

Terebratalia coreanica, which is a large species is characterized besides its beautiful color by having a sulcation in the anterior commissure, a curved lateral commissure that governs the anterior and lateral growths of the valves. The roundness of the lateral corners and anterior edge and the convexity of both valves are also characteristic. For measurements, the length and maximum width of the ventral valve and convexity of both valves were chosen. The percentages of the Width (W) and Convexity (C) to the Length (L), and the same of the Length (L), Width (W) and Convexity (C) to the Sum (S) were obtained from these measurements. The details of the measurements are omitted in this paper.

The provinces, localities and geological occurrences of the measured specimens are shown in the following:

Living species:

1. The province of Mutsu Bay.

IGPS*, nos. 23633; 56792; 52880; 54056.
Number of Individuals: 89.

2. The province of the Tsugaru Strait.

St. 645, 41° 06′ 19″ N., 140° 19′ 15″ E., in 115 m., bottom temperature 14 4° C., muddy sand shells, Aug. 22, 1930, IGPS, no. 56258;

St. 652, 41° 27′ 08″ N., 140° 23′ E., in 110 m., bottom temperature 14.0°C., gravels, Aug. 24, 1930, IGPS, no. 56253;

St. 654, 41° 33′ 25″ N., 140° 56′ 50″ E., in 44 m., bottom temperature 20.5°C., rocks, Aug. 30, 1930, IGPS, no. 56257;

St. 658, 41° 39′ N., 141° 33′ 27″ E., in 113 m., bottom temperature 16.3°C., Aug. 30, 1930, IGPS, no. 56742;

St. 65, 41° 16′ 30″ N., 140° 24′ E., in 91 m., bottom temperature 15.2°C., gravels, Aug. 23, 1930, IGPS, no. 56256;

Hakodate, Hokkaido, IGPS, no. 12945.
Number of Individuals: 8.

3. The northern province of the Japan Sea.

St. 638, 40° 31′ 15″ N., 139° 30′ 45″ E., in 73 m., bottom temprature 16.6°C., rocks, Aug. 18, 1930, IGPS. no. 56255;

St. 613, 38° 32′ 30″ N., 139° 01′ 50″ E., in 254 m., bottom temperature 3 2C., mud, Aug. 13, 1930, IGPS, no. 56254.
Number of Individuals: 3.

4. The middle province of the Japan Sea.

St. 572, 37° 52′ 55″ N., 137° 45′ E., in 132 m., bottom temperature 16.8C., rocks, July 27, 1930, IGPS, no. 56246;

St. 575, 37° 48′ N., 137° 18′ E., in 123 m., bottom temperature 16.8C., sand, July 28, 1930, IGPS, no. 56244;

St. 580, 37° 17′ 50″ N., 137° 17′ 10″ E., in 135 m., bottom temperature 14.2°C., sand, July 29, 1930, IGPS, no. 56245;

St. 582, 37° 01′ 35″ N., 137° 04′ 55″ E., in 176 m., bottom temperature 12.1°C., sandy mud, July 30, 1930, IGPS, no. 56250.
Number of Individuals: 6.

5. The southern province of the Japan Sea.

St. 520, 35° 43′ N., 133° 07′ 30″ E., in 75 m., bottom temperature 23.3°C., sand, Aug. 23, 1929, IGPS, nos. 59247, 56264, 56740;

St. 524, 35° 39′ N., 134° 04′ 30″ E., in 88 m., bottom temperature 22.5°C., shale and sand, Aug. 23, 1929, IGPS, no. 56743;

St. 525, 35° 41′ 30″ N., 134° 18′ 30″ E.,

* IGPS, abbreviation for Institute of Geology and Paleontology, Sendai.

in 137 m., bottom temperature 14.0°C., sand, Aug. 23, 1929, IGPS, no. 56249;

St. 519, 35° 41′ 20″ N., 133° 39′ E., in 81 m., bottom temperature 23.3°C., sand, Aug. 20, 1929, IGPS, no. 56248;

St. 502, 35° 59′ 45″ N., 132° 57′ E., in 110 m., bottom temperature 18.6°C., sand, Aug. 15, 1929, IGPS, no. 56252;

Off-shore, Kyoto Prefecture, IGPS, no. 12001.

Number of Individuals: 10.

6. The northern province of the Pacific Ocean.

St. 84, 40° 14′ 30″ N., 141° 48′ 30″ E., in 101 m., bottom temperature 16.6°C., sand, Nov. 2, 1926, IGPS, no. 56263;

St. 86, 40° 16′ 30″ N., 141° 53′ E., in 86 m., bottom temprerature 16.0°C., sand, Nov. 2, 1926, IGPS, no. 62102;

St. 66, 40° 28′ 40″ N., 142° 01′ 51″ E., in 165 m., bottom temperature 13.7°C., sand, July 21, 1926, IGPS, no. 56260;

St. 85, 40° 30′ N., 141° 51′ E., in 91 m., bottom temperature 16.0°C., sand, Nov. 2, IGPS, no. 56259.

Number of Individuals: 4.

7. The middle province of the Pacific Ocean.

Enoshima, Ojika-gun, Iwate Prefecture, IGPS, no. 12943;

Yanoura, Ojika-gun, Iwate Prefecture, IGPS, no. 12944;

St. 133°, 36′ 09″ N., 140° 46′ E., in 33 m., bottom temperature 9.9°C., fine sand, May 12, 1927, IGPS, no. 56251;

St. 26, 37° 15′ 30″ N., 141° 30′ 40″ E., in 231 m., bottom temperature 5.2°C., muddy sand, July 2, 1926, IGPS, no. 56262;

Onahama Bay, Iwaki-gun, Fukushima Prefecture, IGPS, no. 56278;

St. 132, 36° 22′ 10″ N., 140° 44′ 36″ E., in 48 m., bottom temperature 8.8°C., gravels and sand, May 12, 1929, IGPS, no. 56261.

Number of Individuals: 15.

8. The southern province of the Pacific Ocean.

St. 440, 32° 12′ 15″ N., 128° 06′ 30″ E., in 152 m., bottom temperature 15.7°C., sand and shells, July 19, 1929, IGPS, no. 52739 (offshore, Kyushu). Only one specimen.

Fossil species:

1. The localities of Chiba Prefecture (Pleistocene):

Umadate, Koda-mura, Ichihara-gun, sandy mud, very fossiliferous.

Number of Individuals: 89.

Jizodo. Makuda-mura, Kimitsu-gun, muddy sand, very fossiliferous.

Number of Individuals: 4.

Minato-machi, Kimitsu-gun, IGPS, no. 15874; Moroichi, Sittu-mura, Ichihara-gun, IGPS, no. 43761; Takata Station, Makuda-mura, Kimitsu-gun, IGPS. no. 45596; Southern cut of Sanuki Station, Kimitsu-gun, IGPS, no. 33595.

Number of Individuals: 11.

2. The locality of Setana, Hokkaido (Pliocene), IGPS.

Number of Individuals: 6.

3. The locality of Nishianecha-motoura-kawa, Hagifuse-mura, Hidaka-gun, Hokkaido, IGPS, no. 50986 (Formation unknown). Only one specimen.

4. The localities of Shimane Prefecture.

Noshirotawa-Tanaka, Nogi-mura, Yasoku-gun, IGPS, no. 52887; Hushina, Tamayu-mura, Yasoku-gun, IGPS, no. 52835 (Formation of both localities unknown). Number of Individuals: 3.

5. The locality of Awaji Isiands.

Wejima, Naya-machi, Tsuna-gun (Formation unknown). Two specimens.

6. The locality of Noto Peninsula.

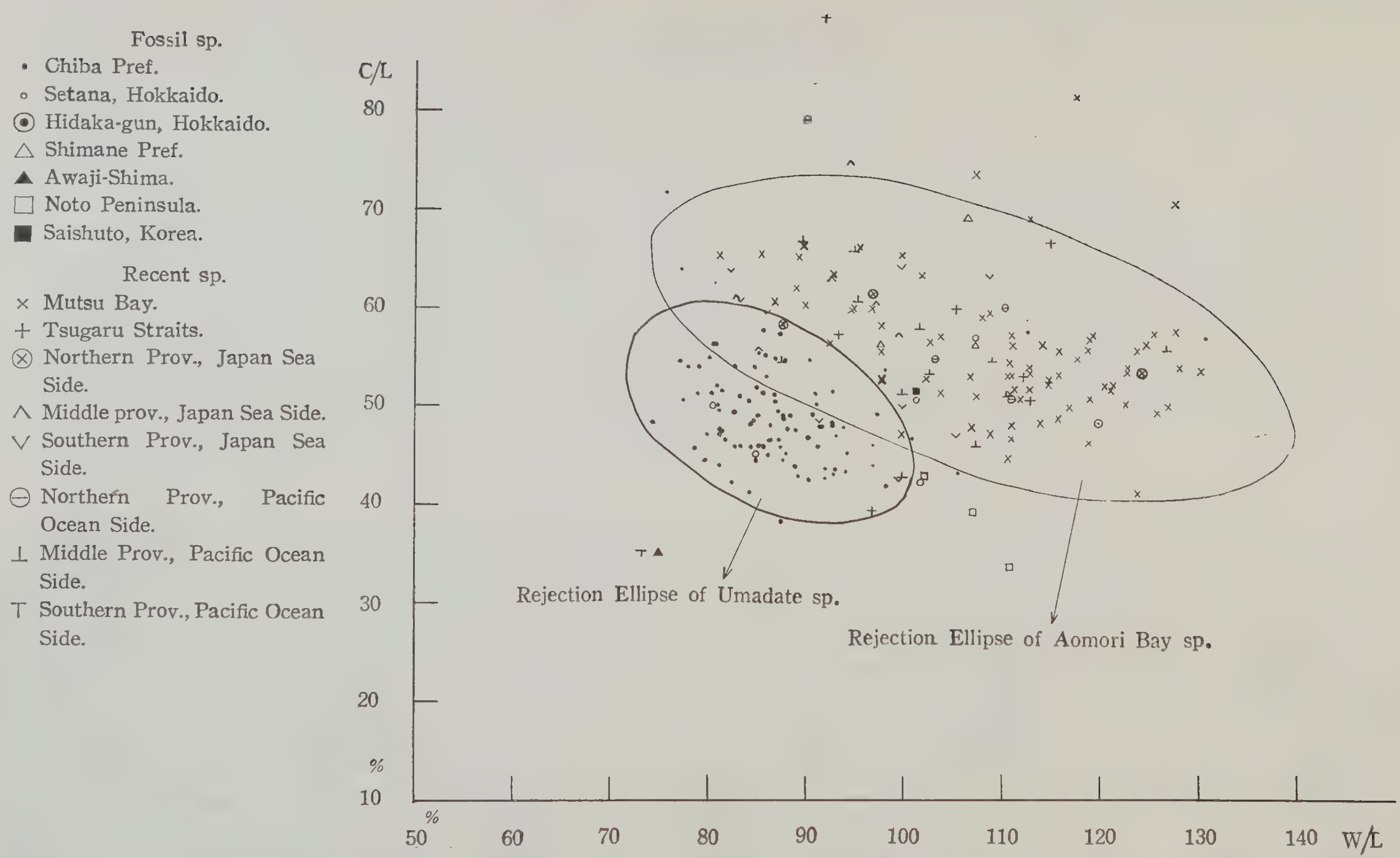
IGPS, no. 52879 (Formation unknown). Three specimens.

7. The locality of Saishu-to, Korea.

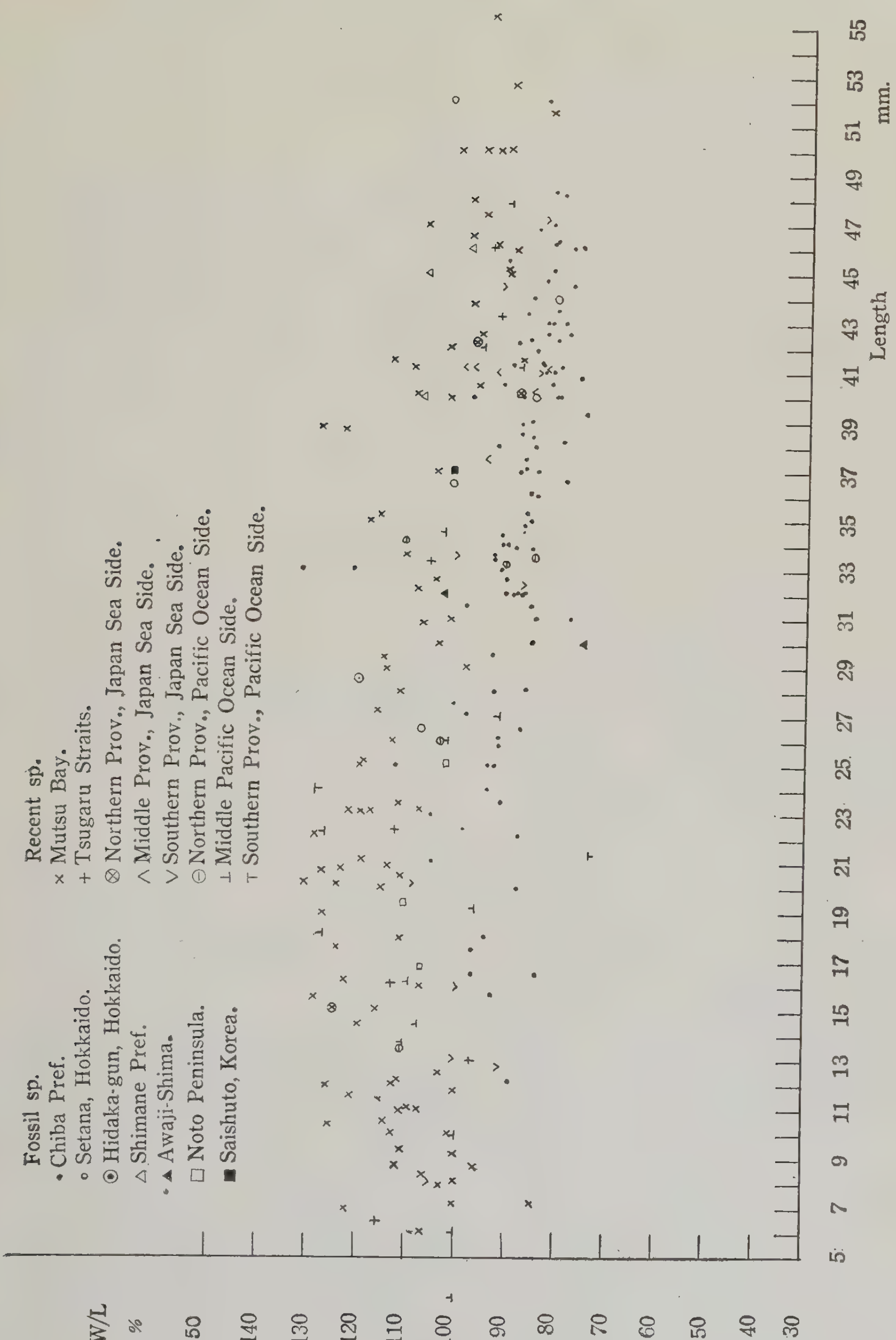
Seikiho, IGPS, no. 36792 (Seikiho Formation: Upper Pliocene or Lower Pleistocene).

The conchometrical study in this paper is based on the above mentioned 136 living specimens and 120 fossil ones.

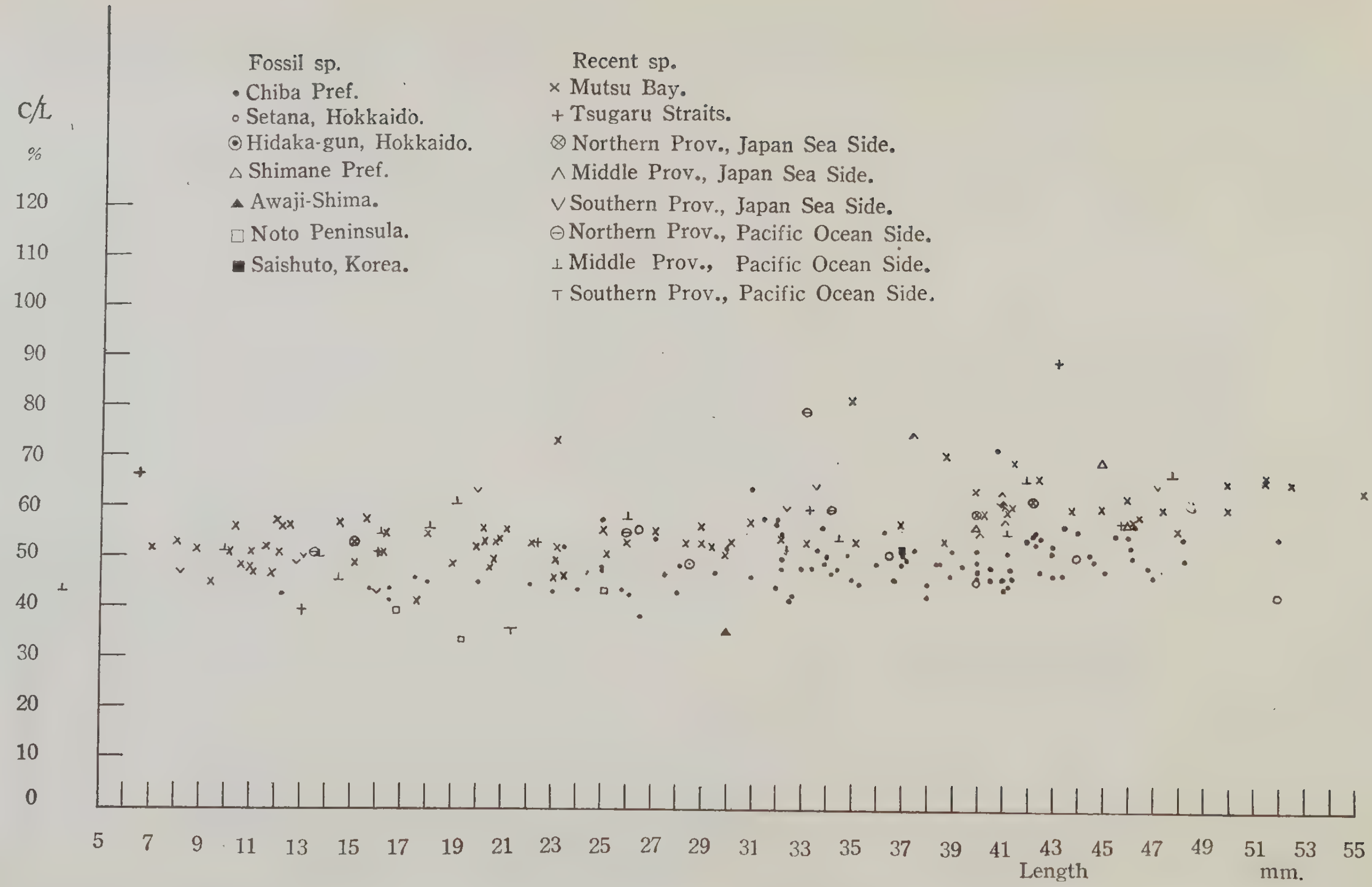
The critical regions are measured within the probable error of a level of the significance of 5 percent of the populations of the Living and Fossil species, with regard to the variations of the W/L and C/L rates as related to time. Hence, using the following equation



Text Fig. 1. Diagram showing the relation between the Width-Length (W/L) ratio and Convexity-Length (C/L) ratio of the valves of the living and fossil species of *T. coreanica* (ADAMS and REEVE). And the rejection ellipse of the populations in the Umadate locality (86 species of 15 52 mm. in length), and Mutsu Bay (47 species of 20 60 mm. in length).



Text-Fig. 2. Diagram showing the relation between the Width-Length (W/L) ratio and Length (L) of the living and fossil species of *T. coreanica* (ADAMS and REEVE).



Text Fig. 3. Diagram showing the relation between the Convexity-Length (C/L) of the living and fossil species of *T. coreanica* (ADAMS and REEVE).

$$F=\frac{(N-2)\cdot N}{(N+1)}\cdot\frac{1}{2\varDelta}\left\{\phi_{22}(x-\bar{x})^2-2\phi_{12}(x-\bar{x})(y-y)+\phi_{11}(y-\bar{y})^2\right\}\quad\cdots\cdots(1)$$

where, F is the value of the level of significance (5%), in the F-distribution under two degrees of freedom $n_1=2$, $n_2=N-2$; N the number of treated specimens; x_i and y_i are the measured values ($i=1, 2, 3, \cdots N$) and $\bar{x}$ and $\bar{y}$ are the sample means; $\phi_{11}=\sum_{1}^{N=i}(x-\bar{x})^2$, $\phi_{12}=\sum_{1}^{N=i}(x-\bar{x})(y-\bar{y})$, $\phi_{22}=\sum_{1}^{N=i}(y-\bar{y})$ and $\varDelta=\phi_{11}\ \phi_{22}-\phi_{12}^2$.

In the equation (1), let $\xi_1=x-\bar{x}$, $\xi_2=y-\bar{y}$. Thus solving the equation (1)

$$\alpha_{11}\,\xi^2+2\alpha_{12}\,\xi_1\,\xi_2+\alpha_{22}\,\xi^2{}_2-1=0\quad\cdots\cdots(2)$$

By equation (2) that shows the ellipse formula, the inclination (θ) of the long axis of the rejection ellipse is obtained by

$$\tan 2\theta=\frac{2\alpha_{12}}{\alpha_{11}-\alpha_{22}}$$

and the lengths of the two axes by the two real roots of

$$\lambda^2-(\alpha_{11}+\alpha_{22})\lambda+(\alpha_{11}\,\alpha_{22}-\alpha_{12}^2)=0$$

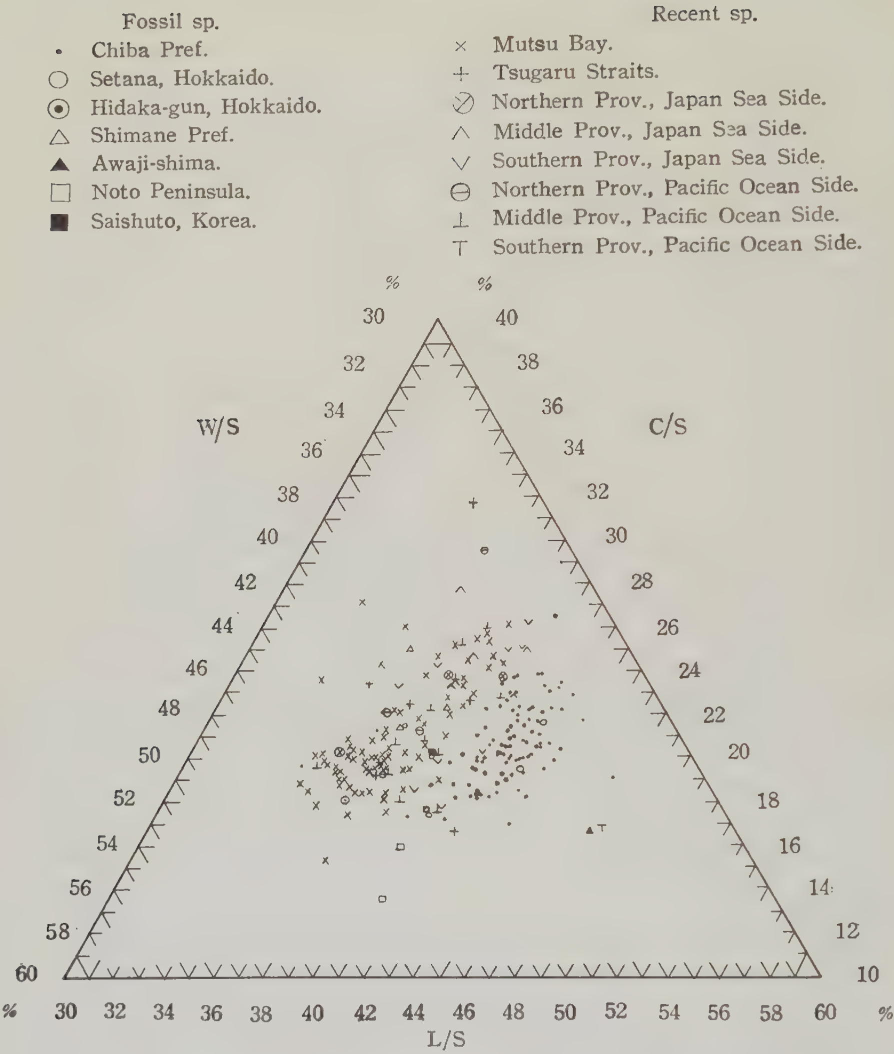
Then, the rejection ellipse of the fossil population in the Umadate locality, Chiba Prefecture, from the young stage (15 mm. in length) to the full grown one (52 mm. in length), is $N=86$, $\bar{x}=86.5\%$, $y=48.4\%$, $\theta=-29°20$, $a=16$, $b=9$, and one of the populations in the Living species from Mutsu Bay, from the young stage (20 mm. in length) to the full grown one (60 mm. in length), is $N=47$, $x=107.2\%$, $y=56.5\%$, $\theta=-18$, $a=34.5$, $b=10.3$.

In all the paired values of the W/L and C/L rates obtained by the calculation, when we plot, W/L, which shows the ratio of the development of the lateral side with the growth toward the anterior and posterior parts, by X axis, and C/L, which represents the degree of inflation of both valves with the growth, by Y axis, serve to determine these critical regions (Text-Figure 1). Without controversy, we may distinctly recognize two types: namely, the one type corresponding to the living species that inhabits Mutsu Bay, and the other corresponding to the fossil species of the Umadate locality (Pleistocene) in Chiba Prefecture.

These two types are also easily distinguishable by the trends and the variabilities of W/L and C/L through the all growth stages (refer to Text-Figures 2 and 3).

The Fossil species from Chiba Prefecture generally show a weaker tendency of inflation of the valves compared with the Living species of Mutsu Bay and vary in outline from orbicular develoment in the young stage (15 mm. in length) to elongate development in the adult and full grown stages. On the other hand, the Living compared with the Fossil species exhibits stronger convexity of the valves and varies in outline from orbicular development in the infantile stage to a strongly transverse one in the young stage, and therefrom to an orbicular or weaker elongate ones in the full grown stage. These relations are obviously distinguishable by the percentages of the Length, Width and Convexity for the above mentioned two forms (Text-Figure 4).

These inter-specific variabilities are as a matter of fact, considered with the discontinuous phenomena that have arisen from the correlation regarding the differences of these morphological charac-



Text-Fig. 4. Diagram showing the variation of the Length (L): Width (W): Convexity (C) relation of the valves of the living and fossil species of *T. coreanica* (ADAMS and REEVE).

ters among the given Living and Fossil species. However, it seems premature to evaluate or compare the variations by the given few samples from the other provinces and localities, excepting the province of Mutsu Bay (Living) and the locality of Umadate, Chiba Prefecture (Fossil). The specific and ecological relationships among them are wholly indistinct or uncertain. The writer does, nevertheless, consider to imply the population from the Umadate locality, as the so-called "Mutation", in the paleontogical sense of WAAGEN (1868), but not in the biological meaning of DE VRIES (1901) with the population repre-

sented by the Living species of Mutsu Bay. Although these critical regions from the infantile stage to the young stage, are unknown partly because none have been collected from the Umadate locality and owing to that such specimens have not been obtained from Mutsu Bay.

It is not proved by the Recent and Fossil populations whether the varieties are due to geographical variation owing to distribution or modification as the ecotype or cline. However, it seems that modification by adaptation influenced by the environmental factors may be important factors.

In conclusion, the writer wishes to say that with the publication of available data to him with regard to *Terebratalia coreanica*, he believes that it may become probable to interpret the specific populations, and to explain the interspecific fundamental relationships existing between the living and fossil species.

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PROCEEDINGS OF THE PALAEONTOLOGICAL SOCIETY OF JAPAN

「日本古生物学会1955年々会」1956年1月21日東北大学理学部地質学古生物学教室に於いて開催した（参会者39名）。講演者並びに講演題目は次の通りである。

岩手県に於ける *Menyanthes* bed の花粉分析について ....山形理・相馬寛吉

On Fossil-Diatoms found in the Oil-Shale from Fukushima-mura, Southern part of Hokkaidô, Japan (代読) ....Kei OSHITE

東北地方第三系産 *Myrica* (*Comptonia*) の3種とその層位学的意義 ....藤岡一男・鈴木敬治

宇部夾炭層産 *Acrostichum* .... 藤岡一男・高橋英太郎

朝鮮第三紀植物化石 ....藤岡一男

On a few Plant fossils from the Izumi Group at the Izumi Mountain Range (代読) .... Hidekuni MATSUO

Permian Plants from Maiya, Miyagi Prefecture.....................................Kazuo ASAMA

日本産 *Gyroporella* に就いて ....遠藤隆次

Evolution of some Groups of Tetracorals...... .... 馬 廷英

On the Fossil and Recent *Stylasterina* from Japan and the Adjacent Water ....Motoki EGUCHI

Pleistocene Foraminifera from the Furuya Formation, Shizuoka Prefecture............... .... Yokichi TAKAYANAGI

Miocene Foraminifera from the Sugota Formation, Akita Prefecture ......Yoshiki KIKUCHI

Miocene Foraminifera from the Oisawa Formation, Yamagata Prefecture....................... .... Yokichi TAKAYANAGI and Yasumi SUZUKI

Paleogene Foraminifera from the Karatsu Coal-field, Saga Prefecture....................... ....Kiyoshi ASANO and Shigeru MURATA

Paleogene Foraminifera from the Yagami Coal-field, Nagasaki Prefecture.................. .... Kiyoshi ASANO

Paleogene Foraminifera from the Tappu Area, Obira-mura, Rumoi-gun, Hokkaido .... Kiyoshi ASANO

Paleogene Foraminifera from Okinoshima and Iojima, Nagasaki Prefecture ....Kiyoshi ASANO and Shigeru MURATA

Upper Cretaceous Foraminifera from the Abeshinai Group, Nakagawa-gun, Hokkaido ...Kiyoshi ASANO and Yokichi TAKAYANAGI

The Fusulinids in the limestone conglomerate of the Yagooki Valley, Tamanouchi, Hinode-mura, Nishitama-gun, Tokyo-to, Japan...... ....Sumio SAKAGAMI

A New Tertiary *Glycymeris* from Namie, Fukushima Prefecture ......Shôzô HAYASAKA

On Some Fossil Glycymerid Molluscs from Japan (代読)........................Saburo KANNO

高島層群より *Vicarya* の産出 ....鎌田泰彦

On the Molluscan fossils collected from the so-called Misaka Series in the Eastern Part of the Tanzawa Mountainland (代読) ....Matsutaro SHIBATA

On the Dentition of *Trigonioides* and its comparison with Allied Pelecypods............ .... Teiichi KOBAYASHI

An Interesting New Form of the Aturidae from the Palaeogene of Northern Japan... .... Teiichi KOBAYASHI

アンモナイトの産状にかんする一資料 .... 小高民夫・菊地良樹

中新世産カニ化石 *Carcinoplax antiqua* (RISTORI), 1889 ....今泉力蔵

九州地方産象化石 ....高井冬二・井上正昭

A Miocene *Stegolophodon* from the Yatuo Group in Toyama Prefecture (代読) .... Tokio SHIKAMA and Yoshihiro KIRII

日本古生物学会例会通知

	開催地	開催日	講演申込〆切日
第64回例会	京都	10月6日	9月15日
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CONSTITUTION
of the
PALAEONTOLOGICAL SOCIETY OF JAPAN

ARTICLE 1. Name

The Society shall be known as the Palaeontological Society of Japan. The Society is a section of the Geological Society of Japan.

ARTICLE 2. Object

The object of the Society shall be to promote the study of palaeontology and related sciences.

ARTICLE 3. Achievement

The Society in order to execute Article 2 shall (a) issue the Society journal and other publications. (b) hold or sponsor scientific lectures and meetings, and (c) sponsor collecting or field trips, and lectures.

ARTICLE 4. Membership

The Society shall be composed of persons who are active or interested in palaeontology or related sciences, and shall be known as regular members, honorary members, and patrons.

ARTICLE 5. The members of the Society shall be obliged to pay annual dues to the Society, for which they shall enjoy the privilege of receiving the Society's journal and of submiting papers which have been read and discussed at the meetings for publication in the Society's journal.

ARTICLE 6. Administration

The Society shall have the following organizations for its administration.

(a) General meeting. The general meeting shall be composed of the Society members. More than one tenth of regular members shall be present to hold general meetings. Administrative affairs shall be decided during the general meeting.

(b) President. The president shall be elected from among the regular members. The president shall represent the Society and supervise its business matters.

(c) Council. The council shall be composed of councillors who are elected from among the regular members. The council shall discuss administrative affairs.

(d) Business council. The business councillors shall be elected from among the council members, and shall administer business affairs.

(e) Officers shall be elected by vote of returned mail ballots, as a general rule.

ARTICLE 7. Amendments to the constitution shall be by decision of the general meeting.

By-Laws and Administration

ARTICLE 8. The Society's journal shall be issued quarterly.

ARTICLE 9. Regular members shall be persons who have knowledge, experience, or interest in palaeontology or related sciences.

ARTICLE 10. Patrons shall be selected individuals or organizations who give special support to the objectives of the Society.

ARTICLE 11. Honorary members shall be persons of distinguished achievement in palaeontology. The council shall nominate honorary memebers for decision by the general meeting.

ARTICLE 12. Applicants for membership to the Society shall submit their full name, mailing address, date of birth, occupation, and name of school from which they graduated.

Dues

ARTICLE 13. Rates for annual dues of the Society shall be decided during the general meeting. Annual dues for regular members are Yen 600.00 (domestic members) and U.S. $ 3.00 (foreign members). Patrons are individuals or organizations donating more than Yen 15,000.00 annually. Honorary members are free from obligations.

ARTICLE 14. The Society income shall be from membership dues and bestowals.

ARTICLE 15. The Society shall have one chairman, fifteen councillors, and several business councillors, whose term of office shall be two years. They may be re-elected.

Addendum

ARTICLE 1. There shall be four business councillors for the present.

ARTICLE 2. According to the By-Law of the Society, foreign members shall receive, beside the Journal, special papers as issued. (postage included).